ESTIMATING THE RELATIONSHIP BETWEEN BRICS AND U.S. STOCK INDEX RETURNS USING PANEL REGRESSION METHODS

by

Adejimi Ademuyiwa

B.Sc., Obafemi Awolowo University, Nigeria, 2011

THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE
IN
BUSINESS ADMINISTRATION

UNIVERSITY OF NORTHERN BRITISH COLUMBIA

July 2015

ACKNOWLEDGEMENT

I thank God Almighty for the successful completion of this work. It has been His grace. I would also like to thank my parents, Mr. Moses Kehinde and Mrs. Juliana Funmilola Ademuyiwa, for their support and prayers in all ramifications. A special thanks to my 'ever-understanding' brother, an IT Consultant, Mr. Adedayo Ademuyiwa and his family in the U.K. Also, to my siblings, Adedoyin, Adebunmi and Adebola, for their moral support. I will not forget to appreciate the patience and encouragement from my best friend and partner, Ifeoluwa Akinbile. A big thank you to Pastor Victor Folorunso and his family. May God continue the good work in you and your family. You are all wonderful.

A special thanks to my supervisor, Dr. Reza Chowdhury, for his support, advices and immense contribution to the success of this empirical work. Also, to my committee members: Dr. Raymond Cox, Dr. Elizabeth Croft, Dr. Jalil Safaei Boroojeny, thank you all for allowing me to tap from your wealth of knowledge. My gratitude also goes to Dr. Usman Lantana and Dr. Saif Zahir for their insightful contributions to this work.

Abstract

This thesis examines the relationships between BRICS (Brazil, Russia, India, China and South Africa) stock index returns and U.S. stock index returns using a panel data covering the period from 1990 to 2013. This relationship is further examined in relation to both the global financial crisis in 2007-2009 and BRICS' own financial crises in 1997-1999. To control for the effects of economic factors on stock markets, three macroeconomic variables including GDP growth rate, nominal interest rate, and exchange rate are included in empirical models. The panel regression methods are used in this thesis. Results reveal that index returns in BRICS stock markets are significantly responsive to the U.S. stock market performance. However, the findings show that the BRICS stock markets did not underperform during the global financial crisis. Instead, BRICS index returns increased during that time. The results also exhibit that while financial crises originated in the BRICS economies adversely affected index returns of respective stock markets in those countries, this negative impact can be reduced by choosing U.S stocks subject to the U.S. stock market performing well during the same time. Hence, a portfolio consisting of stocks from both BRICS and U.S. markets could be beneficial for reducing the risk of financial crisis. The thesis concludes with policy recommendation suggesting that a close monitoring of U.S. financial market is critical for BRICS investors who prefer to invest in U.S. stocks. Also, there is a need for international fund managers who invest in newly emerging stock markets to evaluate the value and stability of domestic currencies as part of their stock market investment decisions.

Keywords: Panel data, BRICS stock index returns, U.S. stock index returns, financial crisis.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Background

The growing importance of emerging countries in the world economy presents new opportunities for investors to design their investment portfolios. The economies of emerging countries have grown at a rapid pace and are becoming increasingly more integrated with the most developed countries in terms of trade and investment. There has been a remarkable shift in the composition of global Gross Domestic Product (GDP) in recent years. In the early eighties, for example, the advanced economies accounted for 69% of global GDP while emerging and developing countries accounted for 31%. In recent times, however, emerging and developing countries account for more than 70% of global GDP, according to the International Monetary Fund (IMF) report of World Economic Outlook as of April 2015. This resulted from improved economic growth of emerging countries, particularly in BRICS[1] in recent years (GDP growth is 2.96%, on average, as of 2014 Q4)[2].

A considerable body of research suggests that financial markets exert a powerful influence on the economic development of a country (Levine, 2005, 1997). For example, when equity, bond, and derivative markets enable the diversification of risk, this encourages more investments in higher-return assets. Further, a well-functioning financial system eases information and transaction costs and thereby enhances resource allocation and economic growth (Beck and Levine, 2004). But, when a financial system fails to perform these functions efficiently, this tends to hinder

[1] BRICS countries include Brazil, Russia, India, China and South Africa

[2] Growth rate of respective BRICS countries include: Brazil (0.2%); Russia (0.7%); India (5.3%); China (7.3%); and South Africa (1.3%). Refer to http://ieconomics.com/brics-gdp-annual-growth-rate-in-2014

economic growth and curtail economic opportunities. Recent growth in emerging countries, particularly in BRICS, is also partially influenced by rapid growth of their stock markets. According to Bloomberg, market capitalization in BRIC (without South Africa) stock markets increased from $2.6 trillion in 2004 to $7.6 trillion in 2014.

In the past decades, the BRICS countries enjoyed economic stability in spite of the recent global financial recession that plagued the world in 2007-2008. Recent economic forecasts have anticipated that BRICS countries will exhibit exceptionally high economic growth rates amongst the emerging countries over the next 50 years. According to Goldman Sachs, it is expected that the total nominal GDP for the four BRIC countries (Brazil, Russia, India, and China) will reach $128 trillion in 2050, compared to $66 trillion for the G7 countries[3] at the same time. Moreover, the combined GDP of the four leading emerging countries is likely to match that of the United States (U.S.) by 2032 (Kupchan 2012). According to Zhang et al. (2013), the BRICS countries are currently at a similar level of newly advanced economic development when compared to other emerging countries. For example, recent statistics report that the share of BRICS in global exports is expected to increase from 12.4% to 20.1% in 2015, while the U.S. export share is projected to fall from 25% to 22% in the same year (Wilson and Purushothaman, 2003). Due to their rapid economic growth and future growth prospects, investors seek financial assets (e.g., stocks, bonds, etc.) in BRICS emerging markets for the prospect of high return on their investments. This, in turn, has resulted in an increase in market capitalization of BRICS stock markets and also increased their financial interdependence from the rest of the world. Hence, understanding about potential return on investment in BRICS stock markets and their responses

[3] G7 countries are Canada, France, Germany, Italy, Japan, the U.S. and U.K.

to changes in economic and financial market fundamentals in both domestic and foreign countries is becoming crucial for potential investors.

Amongst the developed economies of the world, the IMF World Economic Outlook (April 2015) reports that the U.S. has the world's largest national economy, representing approximately 22% of nominal global GDP at the end of 2014. One of the largest and most influential financial markets in the world today is operated in the U.S. – the New York Stock Exchange (NYSE). According to Business Insider (November 2014), the market capitalization of the NYSE is approximately $21 trillion. However, the U.S. subprime mortgage crisis in 2007 not only affected their credit markets but also caused U.S. stock markets to lose value. Between July 2007 and early March 2009, the Dow Jones Industrial Average, for example, dropped from 14,000 to 6,547.05. The subsequent effects of this recent financial crisis in the U.S. have been characterized as the worst financial turmoil since the Great Depression of 1929 (Dimitriou et al., 2013). The worst part of this financial downturn in the U.S. is that the consequences of this crisis quickly converted into a global financial crisis. However, the amount of total foreign capital mobility through investment in foreign stocks increased substantially throughout the world after the global financial crisis. The U.S. Treasury data shows that while American investors held foreign stocks of about $5.2 trillion, foreign investors held U.S. stocks of about $3.1 trillion at the end of 2007 (U.S. Treasury Department, 2008)[4]. After the financial crisis, foreign stock holdings by American investors grew to $9.1 trillion by the end of 2013, while at the same time foreign investors' holding of U.S. stocks also increased to $5 trillion. This could be because investors started looking for more attractive places for higher return on their investments; American investors increased investment in stock markets with high growth prospects, and

[4] Only in East Asian stock markets, U.S. investors had total investment of $1.1 trillion whereas investors from East Asia invested $560 billion only in the U.S. stock market as of mid-June 2007.

foreign investors preferred to invest in cheap American stocks with a hope for higher capital gain in coming years. As a result, the co-integration among individual stock markets worldwide, including NYSE and other stock markets in emerging countries, significantly increased after the recent global financial crisis (Chkili and Nguyen, 2014). It is therefore important to understand how the U.S. stock market might influence the performance of other stock markets in emerging countries. In addition, it is crucial to determine whether and how the U.S. stock market's downfall in 2007-2008 affected potential investors' return on investment in stocks in emerging countries. Likewise, it is interesting to know to what extent the U.S. stock market might play an important role in overcoming the adverse effects of country-specific financial turmoil in emerging countries. In this thesis, I address the aforementioned financial issues by considering stock index returns of NYSE and five BRICS countries as indicators of stock market performance in developed and emerging stock markets, respectively during the period 1990 to 2013. Accordingly, I answer the following three research questions in my thesis:

1) How does the U.S. stock market performance influence BRICS stock markets?

2) How did BRICS stock markets react to the effects of the 2007-2008 financial crisis in the U.S stock market?

3) What is the consequence of financial crises originated in BRICS economies on their stock index returns and what is the role of the U.S. stock market performance during such crises?

1.2 Overview of BRICS stock markets

Brazil: The Brazilian stock market was incorporated in 1890 but started a new system of electronic trading in 1997. The market has high potential for growth as the economic policies allow free flow of capital into the economy thereby encouraging foreign investors to invest in

this market. Currently, the Brazilian stock market is growing at an annual rate of 18.2% per annum according to a recent report by Bloomberg which stated its market capitalization of $824 billion as of January 2015 (Bloomberg, 2015).

Russia: In late 1994, the Russian stock market started an electronic trading system in its operation. The main market in Russia is the Moscow Stock Exchange, which was developed after the merger of the two largest Moscow-based exchanges, the Moscow Interbank Currency Exchange (MICEX) and the Russian Trading System (RTS) on 19th December 2011 (Serikova, 2012). According to Worstall (2014), the market is currently growing at an annual rate of 18.7%, and total market capitalization is about $531 billion as at November 2014. This growth was driven by excellent performance of many Russian companies, especially the oil companies that attracted a large number of foreign investors (Saleem and Vaihekoski, 2008). This has resulted in increased foreign equity ownership during the last decade.

India: The largest stock exchange in India is the Bombay Stock Exchange (BSE), incorporated in 1875. In 1995, the stock market started providing modern, fully automated, screen-based electronic trading system, which facilitated easy trading for investors around the country. It is also considered the oldest exchange in the South Asia region. According to the World Federation of Exchanges (January report), this exchange market is ranked as the tenth largest stock market in the world with a market capitalization of $1.7 trillion as of January 2015. Considering its significant annual growth rate of about 8.5%, investors see this market as a potential avenue to increase wealth.

China: The Chinese stock market is the largest market when compared with other emerging markets in the world. It has the two fastest growing stock markets including the Shanghai Stock

Exchange and the Shenzhen Stock Exchange. According to the World Federation of Exchanges (January report), the Shanghai Stock Exchange is the world's third largest stock market by market capitalization at $5.5 trillion as of May 2015.According to Bloomberg's report, the Shenzhen Stock Exchange, the world's ninth largest stock market, is valued at a total market capitalization of $4.4 trillion as of May 2015[5]. The report further states that, for the first time since 2008, the Shanghai Composite Index climbed 8.9% in the first week of June 2015, closing the market at above 5,000. Global investors, therefore, experience high growth potential in this market.

South Africa: South Africa is the second largest economy in the African region[6]. The country has favorable economic policies in the region, which tend to attract a large number of foreign investors in South Africa (Jefferis and Okeahalam, 2000). The country currently enjoys an annual growth rate of 5%. As a result, South Africa has the largest stock exchange in Africa, which is currently ranked nineteenth in the world in terms of market capitalization. JSE limited, previously Johannesburg Stock Exchange (JSE), has about 500 listed companies and a market capitalization of over $1 trillion as of 2014, according to its official website. The JSE was formed in 1887 during the first South African gold rush. Similar to other BRICS countries, the JSE upgraded to an electronic trading system in the early 1990s.

---

[5]Refer to "China's Stock Market on track to reach $10 Trillion in Value" by Kyoungwha Kim, *June 5, 2015*

[6] Currently, in terms of GDP, Nigeria is the largest economy in the region. "Specific to Nigeria, recent rebased Gross Domestic Product (GDP) ranked the country as the largest economy in Africa (Usman, 2015 citing National Bureau of Statistics (NBS), 2014, p. 413). The new data estimated the Nigerian economy at N80.3 trillion ($510 billion) for 2013 (NBS, 2014). An NBS report released on April 7, 2014, revealed diverse economic activities ranging from agriculture with about N17.26 trillion, trade N13.35 trillion, crude petroleum and natural gas N11.55 trillion, telecoms N6.97 trillion, real estate N6.43 trillion, manufacturing N5.47 trillion, food, beverages, and tobacco N3.70 trillion, finance and insurance N2.64 trillion, and motion picture, sound recording, and music production N1.13 trillion. The nine sectors listed above contribute 85.4% of the total GDP" (Usman, 2015, p. 413).

1.3 Motivation for this thesis

Due to their rapid growths in the financial sectors, BRICS stock markets can easily attract increasing amounts of international capital. Further, global investors persistently seek attractive asset classes in order to gain more "bang-for-the-buck". This has led to the need for better understanding of the function of BRICS stock markets, their dynamic risk-return properties, interrelationships, and reactions to developed markets. Understanding these properties related to BRICS stock markets is now becoming a fundamental concern for international investors, policymakers, and portfolio managers. Moreover, there has been a fast trend of development in both economic and financial structures including the commodity market, the money market and the foreign exchange market of BRICS countries. It is, therefore, also becoming important among foreign investors and investment bankers to understand whether such rapid growth of BRICS financial markets should be attractive for portfolio investment. While existing research explores these issues in the context of developing versus developed countries, as well as in case of financial market crises, in general, there is not sufficient evidence that explains the above dynamic relationship between developed and emerging stock markets, particularly BRICS, with respect to global versus domestic financial crises. This gap in literature motivated me to address my research questions, as stated in section 1.1.

1.4 Significance of this thesis

This thesis makes important contributions by focusing on aspects of BRICS stock markets using panel estimation. The major contributions of the thesis are as follows:

1. Several studies have examined the relationship between BRICS stock markets and U.S. stock markets. Some of the most recent studies include Hwang et al. (2013). They have

studied this relationship by using time series data. The thesis will provide additional literature related to the topic.

2. Another major contribution is in terms of the effects of financial crisis. Although the effects of the recent U.S global financial crisis on BRICS stock index returns is increasingly recognized in earlier research, a limited number of studies have examined the effect of BRICS-specific financial crises. This thesis, however, examines the effect of both the recent global financial crisis of 2007-2008 and individual financial crises of BRICS countries simultaneously to understand their relative consequences on BRICS stock markets.
3. As of 2010, Brazil, Russia, India and China were considered as the fastest growing emerging countries. Later on, South Africa became a member of this group of emerging economies in December 2010, which finally formed the group of countries called BRICS. No study has, however, observed whether inclusion of South Africa in 2010 made a major change in the relationship between U.S.-BRIC stock index performances. This paper has addressed this gap in the literature.

The rest of this thesis is organized as follows: Chapter Two gives a review of related literature on the relationship between developed stock markets and emerging stock markets with emphasis on the BRICS countries. The chapter also highlights how this paper differs from others. Chapter Three discusses panel data and methodology employed in this empirical thesis. In Chapter Four, the estimated empirical results are presented and discussed. Chapter Five includes conclusion and policy recommendations as well as suggestions for potential areas for future research.

1.5 Limitations of this thesis

This thesis faces limitation in terms of obtaining data for specific time intervals. For instance, while I have access to monthly data for stock index returns for BRICS countries, there is no monthly data of several country-specific variables (e.g., GDP growth) for some BRICS countries such as South Africa. As such, monthly data is used to make data frequency consistent for all countries. Another limitation faced in this study is the presence of outliers (for example, the presence of extreme values of nominal interest rate for Brazil in 1993 and 1994). Removal of these outliers by using extreme studentized deviate test has reduced the sample size in this thesis.

CHAPTER TWO

LITERATURE REVIEW

This chapter highlights key findings of relevant literature. Section 2.1 describes earlier studies on the relationship between developed stock market index returns and emerging stock market index returns. It also summarizes the findings in literature that address the effect of the most recent global financial crisis in the U.S. economy on stock market performance. Section 2.2 focuses on the relationship between stock market returns and macroeconomic indicators in both developed and developing countries. Section 2.3 includes findings about the relationship between stock market performance and economic fundamentals in BRICS countries. Section 2.4 summarizes the chapter.

2.1 Relationship in stock market index returns and emerging stock market index returns

The integration of emerging stock markets with developed countries is becoming increasingly significant. The U.S. stock market, for example, plays a critical role in international capital flows and thus influences subsequent returns of stock indices in other stock markets worldwide. This section therefore provides some of the recent studies that have examined such relationship among stock markets between developed and emerging countries.

2.1.1 Developed versus emerging stock market index returns

A number of studies have examined the co-movement in stock index returns between developed and emerging stock markets. Most of the studies have focused on the US stock markets and measured its performance by either S&P 500 or NYSE stock index returns. For example, Hwang et al. (2013) uses an exponential form of a time-series model (i.e., Dynamic Conditional

Correlation Exponential Generalized Autoregressive Conditional Heteroskedastic model) to estimate dynamic conditional correlation of stock returns between S&P 500 index and that of ten different emerging stock markets. The study covers the period from January 2006 to December 2010 including stock markets from emerging countries of Brazil, Russia, India, China, South Africa, Korea, Thailand, Philippines, Taiwan, and Malaysia. It identifies the underlying reasons of co-integration between the U.S. and these emerging stock markets. The study finds a strong positive interaction in stock index returns between S&P 500 and corresponding emerging markets' index returns. To identify channels of contagion, the study utilizes a model (i.e., Dynamic Conditional Correlation Multivariate Generalized Autoregressive Conditional Heteroskedastic model) that allows simultaneous estimation of conditional correlation coefficients and determinants of conditional correlation over time. The study finds that "increase in both the U.S. CDS (Credit Default Swap) spread and TED (Treasury Bills and Eurodollar future contracts) spread decrease conditional correlations. In contrast, increases in the VIX (Volatility Index of the Chicago Board Options Exchange Market), foreign institutional investment, and exchange rate volatility raise conditional correlations between S&P 500 and other emerging countries' indices." (p. 346)

Likewise, Harrison and Moore (2009) investigates co-movement in stock index returns between emerging countries of Central and Eastern Europe (CEE) including Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, and Slovak Republic, and two developed countries of Western Europe (Germany and the UK) between 1994 and 2006. In order to address the relationship between stock markets of these countries, they apply a multivariate BEKK-GARCH[7] (p. 1514) model that estimates both mean-to-mean and variance-to-variance

[7] BEKK-GARCH model stands for Baba, Engle, Kraft and Kroner GARCH model.

spillover effects over time. Their results suggest that there is a common stochastic (random) trend in stock index returns between CEE and the remaining two developed countries in Europe.

In a recent study, Guesmi and Fattoum (2014) also do a time-series analysis using GJR-DCC-AGARCH model approach developed by Glosten et. al. (1993) to estimate dynamic conditional correlations in stock markets and five oil importing developed countries (USA, Italy, Germany, Netherlands and France) and four oil-exporting emerging countries (United Arab Emirates, Kuwait, Saudi Arabia and Venezuela) for a ten-year period (2000 – 2010). They find that "cross-market co-movements as measured by conditional correlation coefficients increase positively in response to significant aggregate demand" (p. 305). In their analysis, they consider oil price changes resulted from both supply and demand side shocks for understanding the role of commodity market on stock price changes. Their findings demonstrate that oil prices and stock prices tend to move together with varying degrees of strength in both importing and exporting countries. They find that when high oil prices are originated from supply shocks, it does not always have a countercyclical impact on stock prices in oil importing countries. However, in the case of oil-exporting countries, supply shocks will cause higher correlation between oil prices and stock prices. Therefore, both commodity prices and corresponding trading patterns in developed countries subsequently determine stock market performance in emerging countries.

2.1.2 Effect of global financial crisis on stock index returns

In another study, Filis et al. (2011) "investigates the time-varying correlation between stock market prices and oil prices for oil exporting and oil importing countries" (p. 152) applying DCC-GARCH-GJR model to analyze time varying correlations between oil and stock prices of oil exporting (Canada, Mexico and Brazil) and oil importing (USA, Germany and Netherlands)

countries, particularly in the crisis period. They conclude that conditional variances between stock prices and oil prices do not vary much between oil exporting and oil importing countries. But their correlation results provide evidence that oil prices demonstrate a negative effect on stock returns, irrespective of the origin of the oil price shock. They, in particular, find a positive correlation between lagged oil prices and stock prices during the global financial crisis. Hence, co-movements between stock returns and commodity prices can be expected during the period of financial crisis.

This evidence is also supported by Creti et al. (2013). The authors use a dynamic conditional correlation model (i.e., DCC-GARCH) to investigate the links between price returns for 25 commodities and stocks over the period January 3, 2001 to November 28, 2011. Their results show that during the 2007-2008 financial crisis period the correlations between commodity and stock returns are highly volatile. They also mention that correlations of several commodities' prices (especially oil, coffee and cocoa prices) with S&P 500 index returns increase in times of increasing stock prices but they diminish in times of bearish financial market. In general, they conclude that the 2007-2008 financial crisis played an important role in determining co-movement between commodity and stock prices.

Using an advanced time-series model (i.e., DCC–FIAPARCH[8]), Dimitriou et al. (2013) investigates financial contagion between BRICS and U.S. stock market returns during global financial crisis. They find a general pattern of isolation in stock markets located in the BRICS countries during the early phase of the crisis period, and a reemerged pattern in stock returns for all these markets after the crisis period. They identify an increasing relationship in stock returns

[8] DCC-FIAPARCH stands for Dynamic Conditional Correlation-Fractionally Integrated Asymmetric Power Autoregressive Conditional Heteroskedastic.

between the BRICS and the U.S. markets during the post-crisis period and conclude that the dependence is larger in bullish than in bearish markets. Recently, Gilenko and Fedorova (2014) use a 4-dimensional BEKK-GARCH-in-mean model which allows for the estimation of mean-to-mean, volatility-to-mean and volatility-to-volatility spillover effects among stock markets between the BRIC countries and three developed economies including USA, Germany, Japan and the MSCI emerging markets index during the pre-crisis, crisis and post-crisis periods. They conclude that in the pre-crisis period, the US market only influenced Chinese market whereas the German stock market had a positive influence on both Brazilian and Chinese stock markets, but had a negative effect only on Russian stock market. The Japanese stock market, on the other hand, had no influence on any of the BRIC markets. During the crisis period, the US stock market had a positive impact on stock market performance in Brazil while Japanese stock market significantly influenced Indian market performance. Finally, in the recovery phase, Gilenko and Fedorova (2014) observed a strong positive influence between the three developed stock markets and the BRIC stock markets. The above findings repeatedly suggest that the inter-relationship among individual stock markets between developed and emerging countries had been significantly changed during the global financial crisis in 2007-2008.

2.2 Relationship between stock index returns and macroeconomic indicators in developed and developing countries

The relationship between stock returns and macroeconomic variables has been extensively discussed over the past decades but most existing studies have examined this relationship in the context of the U.S. and other advanced countries. Earlier studies like Fama (1981) and Schwert (1990) have shown that stock returns are strongly and significantly related to domestic macroeconomic indicators such as interest rate, exchange rate, real GDP, inflation rate, and

foreign stock market indices, amongst others. Some of these studies show that macroeconomic variables are substantial to explain variation in annual stock returns. Further, Schwert (1990) explains that information about future real economic activity may be reflected in stock prices well before it occurs and asserts that changes in stock prices result in changes in individuals' demand for investment goods. As such, previous changes in stock index returns might have an impact on current changes in index returns. Having provided a general overview of the relationship between stock returns and macroeconomic activity, specific examples have been cited in the following subsections.

2.2.1 Stock index returns and macroeconomic indicators in developed countries

According to the study carried out by Bulmash and Trivoli (1991) on the relationship between U.S. stock market index and some selected macroeconomic variables (i.e., M2 money, short term interest rate, and long term interest rate), the effect of economic indicators on index returns varies between the short and long runs. They find that there exists a positive relationship between the U.S. stock market index and money supply (M2) in the short-run. In the long run, on the other hand, a negative relationship exists between index returns and M2 as well as both short- and long-term interest rates. Lately, Ratanapakorn and Sharma (2007) examine both short-term and long-term relationships between the U.S. stock price index (S&P 500) and six macroeconomic variables over the period 1975:1-1999:4. They observe money supply, industrial production, inflation, exchange rate, short-term interest rate, and long-term interest rate with the S&P 500 index returns and found a negative association with all variables in the long run. In the short run, their findings indicate a negative relationship between stock index returns and government bond yield and long-term interest rate while it is positively related to money supply, industrial production, inflation rate, exchange rate, short-term interest rate, and Treasury bill rate.

Likewise, Kim (2003) investigates the long-run relationship between U.S. stock prices and several economic variables such as industrial production, real exchange rate, interest rate, and inflation. The study covers monthly data for the period January 1974 to December 1998. Using Johansen's cointegration analysis, the result shows that stock price is negatively related to the real exchange rate, interest rate, and inflation but positively related to industrial production. Using a multivariate cointegration methodology, Chaudhuri and Smiles (2004) examine the long run relationship between real stock price and measures of real activity including real GDP, real private consumption, real money and real price of oil in Australian stock market. The study uses quarterly data from January 1960 to April 1998. The analysis shows that real GDP, real money and real price of oil have a negative impact on stock prices while real private consumption is positively related to stock prices. Similarly, Humpe and Macmillan (2009) applied cointegration analysis in order to model the long-term relationship between industrial production, consumer stock price index, money supply and long term interest rates, and stock prices in the U.S. and Japan. They used monthly data from 1965 to 2005. They find consistency with a single cointegrating vector in the U.S. where a negative relationship exists between stock prices and both consumer price index and long term interest rate while a positive relationship persists with industrial production.

Furthermore, Griffin and Stulz (2001) examine the importance of exchange rate and industry competition for stock returns using weekly data of industry indices from the U.S., Canada, United Kingdom, France, Germany, and Japan from 1975 to 1997. They find that exchange rate shocks have a trivial impact on individual returns of industry indices in all six industrialized countries. Recently, Mollick and Assefa (2013) study the dynamics between U.S. stock returns (S&P 500, Dow Jones, NASDAQ and Russell 2000) based on wide range of information and

some selected macroeconomic and financial variables (i.e., inflation, Chicago Board Options Exchange volatility index (VIX), interest rates, gold prices, and exchange rates) for the period January 1999 – December 2011. They apply both GARCH (1,1) specification and MGARCH-DCC models to identify the factors that influence daily U.S. stock returns. They assert that fluctuations in exchange rates (necessitated through higher trade and GDP channel), uncertainty in equity markets and predicted inflation have a negative impact on expected earnings of firms, and thus influence their stock returns significantly. They also conclude that the correlation between index returns and macroeconomic variables changed during the recent financial crisis in 2008-2009.

2.2.2 Stock index returns and macroeconomic indicators in emerging countries

Earlier studies have examined the dynamics in emerging markets and have provided varying conclusions. For instance, Goswami and Jung (1997) study Korean stock market and demonstrated the effects of some economic factors on the market using Vector Error Correction Model (VECM). The selected sample period is from January 1980 to June 1996. According to their findings, the Korean stock prices are positively related to industrial production, inflation and short-term interest rates but negatively related to long-term interest rates and oil prices. Wongbangpo and Sharma (2002) also study the effect of selected macroeconomics variables (i.e., money supply, gross national product, inflation, interest rate, and exchange rate) on stock prices in five ASEAN[9] countries (Indonesia, Malaysia, Philippines, Singapore, and Thailand). They find a negative long run relationship between stock prices and interest rates in the Philippines, Singapore and Thailand while a positive relationship is obtained in Indonesia and Malaysia. In addition, the exchange rate is positively correlated with stock prices in Indonesia,

[9] Association of Southeast Asian Nations

Malaysia, and the Philippines but negatively related in Singapore and Thailand. Using a Markov-Switching EGARCH model, Chkili et al. (2011) examine the dynamic relationships between exchange rates and stock returns in four emerging countries (Hong Kong, Singapore, Malaysia and Mexico) in Asia during both normal and turbulent periods. Their results provide evidence that exchange rate has significant impact on stock markets in the selected countries; however, this relationship varies from one country to another.

Pilinkus (2009) examines the relationship between Lithuanian stock market and six different macroeconomic variables including gross domestic product, M1 money supply, unemployment rate, exchange rate, interbank offered rate, and consumer price index. He finds that Lithuanian stock index (OMXV) return increases due to increases in gross domestic product and money supply while it falls as a result of decreases in unemployment rate, exchange rate, and interbank rate. He, however, finds mixed evidence in the case of changes in inflation. In a later study, Pilinkus (2010) considers how ten different macroeconomic indicators influence stock market performance in the Baltic States including Estonia (OMXT), Latvia (OMXR), and Lithuania (OMXV). Generally the author finds causality between a number of macroeconomic variables and stock market indices in the Baltic States. He investigates both short term and long term relationships using vector autoregression and Johansen multiple cointegration models, respectively. According to his findings, the combined effect of macroeconomic indicators on stock index returns, based on adjusted R-square, is explained by only 37 percent (Lithuania), 39.9 percent (Latvia), and 36.4 percent (Estonia) in short-run while changes in economic fundamentals explain almost 99 percent variations in index returns of all these markets in long-run. Therefore, his findings suggest a significant long-term impact of macroeconomic performance on index returns in an emerging country. Further analysis shows that stock index

returns have a significant positive relationship with total import and inflation while are negatively affected by changes in real GDP and export in Estonia. In the case of Lithuania stock market, a positive relationship exists between index returns and real GDP, import, and short-term interest rate while a negative relationship persists with total volume of export, and trade balance. Lastly, he finds that increases in real GDP and trade balance results in increase in market index returns in Latvia. In contrast, changes in inflation and short-term interest rate have a significant negative impact on stock market performance in Latvia.

Using VECM model, Osamwonyi and Evbayiro-Osagie (2012) examine macroeconomic variables and the Nigerian capital market. The authors consider the yearly data of several macroeconomic variables of interest rates, inflation rates, exchange rates, fiscal deficit, GDP, and money supply from 1975 – 2005. "The major finding is that macroeconomic variables influence stock market index in Nigerian economy" (p. 55). Likewise, Maku and Atanda (2009) also study the relationship between the Nigerian Stock Exchange All Share Index prices and five different macroeconomic variables from 1984 to 2007. They use annual times series data in their analyses including the NSE index, inflation rate, Treasury bill rate, exchange rate, broad money supply, and real economic output. Their results indicate that changes in the NSE all share index returns are consistently determined by changes in exchange rate, inflation, money supply, and real output both in short- and long-run in Nigeria. Precisely, increases in the magnitude of all these variables decrease stock prices in the Nigerian stock market. Recently, Eita (2012) identifies the macroeconomic determinants of stock prices in Namibia using a VECM econometric methodology for the period 1998-2009. The results exhibit that change in Namibian stock prices can be explained by differences in economic activity, interest rate, inflation, and exchange rates.

Furthermore, Narayan and Narayan (2010) conduct an investigation on the impact of oil prices on Vietnamese stock market prices. They consider nominal exchange rate as a control variable. They use daily data for the period 2000-2008. They find that stock prices, oil prices and nominal exchange rates are co-integrated (they have a long-run relationship) and as such they find neither oil price nor exchange rate has a significant effect on stock returns in the short run estimate. By using an error correction model, they, however, find that both oil price and exchange rate have positive and significant impact on stock prices in Vietnam in the long run. The authors also build a general autoregressive conditional heteroskedasticity (GARCH 1, 1) model of stock prices as a result of an ARCH effect in the residuals. The results from the GARCH model also confirm the above significant relationship between the variables and stock prices. However, they find that the impact of domestic factors is more dominant than oil price changes in determining subsequent changes in Vietnamese stock market performance. This signals the importance of own macroeconomic variables in explaining the movement of stock prices in Vietnam. In another study, Ibrahim and Aziz (2003) use co-integration and vector autoregression methods to analyze the dynamic linkages between stock prices and four macroeconomic variables (i.e., industrial production, money supply, consumer price index, and exchange rate) for Malaysia. They use monthly data over the period 1977-1998 in their study. The results suggest that while industrial production and consumer price index are positively associated with changes in stock prices both in short- and long-run, exchange rate is negatively associated with stock price movements. Finally, Buyukşalvarcı (2010) examines stock price behavior of the Turkish stock market. He considers several macroeconomic variables including consumer price index, money market interest rate, gold price, industrial production index, oil price, foreign exchange rate, and money supply in the study for the period 2003-2010. The result suggests that increases in interest rate,

industrial production, oil price, and exchange rate decrease index prices whereas increase in the money supply inflates stock prices in Turkey, in general.

2.3 Relationship between stock market performance and economic fundamentals in BRICS countries

A number of studies have investigated the relationship between macroeconomic variables and BRICS stock returns using time series data. Some have analyzed one or two of the BRICS countries separately while others have analyzed all BRICS countries in one study. Studies that analyzed some of the BRICS countries include Jefferis and Okeahalam (2000) where the impact of some selected macroeconomic variables such as real GDP, real exchange rate, and interest rate on stock prices for South Africa is examined. Their results show that stock market returns are positively affected by real GDP and real exchange rate but negatively influenced by real long-term interest rate. Likewise, Hsing (2011) examines how South Africa's stock market index prices (using Johannesburg Stock Exchange index as a proxy) are affected by changes in real GDP growth rate, money supply, US stock market index, government deficit, real interest rate, nominal effective exchange rate, inflation rate, and US government bond yield. Using an exponential GARCH model, the results suggest that there exists a significant and positive relationship between South Africa's stock market prices and real GDP growth rate, money supply, and the US stock market index prices while a negative relationship exists with other analyzed variables. Alagidede and Panagiotidis (2010) also investigate the relationship between stock prices and inflation for selected African stock markets. They reveal in their results for South Africa that in the short run, stock prices show a transitory negative response to the consumer price index while in the long run, a positive response exists between the two variables. The authors suggest that stocks are usually used to hedge against inflation in long run in the

South Africa. In another study, Alam and Uddin (2009) examine the relationship between stock prices and interest rates for fifteen countries[10]. Their analysis is based on monthly data from January 1988 to March 2003. They observe that South Africa is among the four countries (other three are Bangladesh, Colombia and Italy) that show a negative relationship for interest rate with share prices implying that high interest rate results in decrease in stock prices in South Africa. Among other BRICS countries, Zhao (2010) studies the dynamic relationship between stock prices in China and Renminbi (RMB) real effective exchange rate using VAR (Vector Autoregressive) and multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. The period covered in the study is from January 1991 to June 2009. The results show that there is no direct relationship between exchange rate and stock markets in China.

Turning to the markets of interest as a group, Gay (2008) examines the relationship between several macroeconomic variables on BRIC (Brazil, Russia, India and China) stock markets during the period 1999-2006. He applies another time-series model, the Box-Jenkins ARIMA, for this investigation. The result shows evidence of no significant relationship between stock market returns and exchange rates as well as oil prices. He is of the opinion that this is not unexpected as other international and domestic macroeconomic variables like production, inflation, and interest rates may have direct impact on stock price changes as macroeconomic indicators are also correlated to each other. Likewise, Chkili and Nguyen (2014) also examine the relationship between stock markets and foreign exchange markets in BRICS countries (South Africa included). They use a Markov switching vector autoregressive model (MS-VAR) to investigate this interaction between stock and foreign exchange markets over the period 1997–

[10]Sample countries are Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, South Africa, Spain, and Venezuela.

2013. They provide evidence that exchange rate changes do not affect stock market returns of BRICS countries regardless of the regimes. They however propose that this relationship is explained by the effective hedging strategies against currency risks through available currency derivatives like currency forwards, futures and options.

2.4 Key observations from literature review

This chapter has attempted to provide some basic overview of a number of relevant empirical studies on the relationship among developed stock markets' index returns, emerging markets' stock index returns, and macroeconomic variables of corresponding countries. Some critical observations from reviewing these studies are as follows:

1. There is a significant relationship in stock price movements between developed, particularly the U.S. market, and emerging as well as developing countries.
2. Changes in country-specific macroeconomic indicators play critical roles in determining market index returns. However, selective economic indicators are critical in explaining such relationship in specific group of countries. For example, market index returns are significantly responsive to changes in interest rate, and gross domestic products in some BRICS countries.
3. Financial crisis influences the above relationships in index returns between developed and emerging stock markets. None of the studies, however, did a comparative analysis to determine the link between U.S. index returns and emerging market index returns in the context of global versus regional financial crises.
4. To identify the underlying co-movement of index returns along with other indices and economic fundamentals of a country, earlier studies use only time-series analyses, and

thus neither of them considers both cross-sectional and country-specific fixed effects simultaneously while estimating the above relationship.

CHAPTER THREE

METHODOLOGY AND DATA ANALYSIS

This chapter covers data and methodology used for the thesis. The first section of this chapter explains the sources of data used and the data analysis. Section 3.2 and 3.3 present the variables used for the model selection and estimation methods, respectively. Discussion on the empirical models is presented in section 3.4. Several diagnostic tests applied on the empirical models are explained, in section 3.5.

3.1 Sample data

The thesis utilizes data from four major sources: the Morgan Stanley Capital International (MSCI) database, Yahoo Finance, World Bank's World Economic Indicators (2014) and OANDA[11]. Monthly data for each BRICS country is obtained from the MSCI Emerging Market index while data for U.S. stock index (NYSE Composite index) is obtained from Yahoo Finance's website. Data on the macroeconomic factors are obtained from World Bank's database (2014) except for exchange rate which is obtained from OANDA database. All prices for the panel data used are denominated in U.S. dollars.

In this thesis, monthly panel data is employed. Two main data series are index returns of BRICS countries and that of the U.S. stock market. Monthly returns of each of these indices are considered as a proxy of stock market performance in BRICS and the U.S. stock markets. The sample period covered is from January 01, 1990 to December 31, 2013. Due to missing data of 266 observations across countries over time, an unbalanced panel data set is used consisting a total of 1,174 observations [= (24×12×5) – 266]. Since stock market performance can be

[11] OANDA is an online foreign exchange company that releases daily exchange rate data.

influenced by economic status of a country, money market condition, and foreign exchange market performance, in general. I consider three individual variables including GDP growth rate, nominal interest rate, and exchange rate, respectively to proxy for each of these markets. The underlying reasons for considering these variables in the empirical model are discussed in the following section. Also, two separate dummy variables are included in the analyses: one, to capture the effect of the 2007-2008 global financial crisis on BRICS stock markets, and the other, to capture the effect of financial crises experienced by BRICS economies as a group.

The choice of panel data in this thesis is due to its unique advantages over time series data. An important advantage of panel data compared to time series or cross-sectional data sets is that it allows identification of certain parameters without the need to make restrictive assumptions. For example, panel data make it possible to analyze changes on an individual level. Panel data are not only suitable to model or explain why individual units behave differently but also to model why a given unit behaves differently at different time. Panel data are typically larger than cross-sectional or time series data sets and explanatory variables vary over two dimensions (individual and time) rather than one. Even with identical sample sizes, the use of a panel data set will often yield more efficient estimations than a series of independent cross-sections (Pradhan et al., 2003).

3.2 Variables for model selection

3.2.1 U.S. stock index returns

The relationship in stock returns between developed and emerging markets is well documented in many studies. For example, Hwang et al. (2013) and Kenourgios et al. (2011) study this relationship and find that U.S. stock returns has significant effect on emerging stock markets

returns. Their results exhibit a strong positive relationship between stock index returns and corresponding emerging markets' index returns. Some studies have examined the dependence and contagion effects between the U.S. stock market and emerging markets. Specifically, Kenourgios et al., (2011) find evidence of financial contagion effect from the two developed markets (U.S. and U.K.) to the BRIC markets. Dooley and Hutchison (2009) are of the opinion that after the 2008-2009 U.S. financial crisis, emerging markets have responded "very strongly to the deteriorating situation" in the U.S. market. A similar result is obtained in Xu and Hamon (2012) where the international transmission of stock prices between the BRICs and the United States on account of the 2008–2009 U.S. financial crisis is significant. Current evidence shows that there are large capital flows between developed (e.g., U.S.) and the BRICS stock markets. Dimitriou et. al., (2013) and Bekiros (2014) show that a rise in international capital flow results in an increasingly positive relationship in stock returns between the BRICS and the U.S. markets. This relationship is observed mostly after the U.S. financial crisis. Likewise, Hsing (2011) find that South Africa's stock market index price is positively influenced by the U.S. stock market index price. They argue that the U.S. stock market index price causes a rise in South Africa's stock market index price due to its capital flows and thus bring about positive effect in returns. Following the previous studies, I use monthly NYSE (New York Stock Exchange) index return data as a proxy for U.S. stock market performance and expect a positive impact of the NYSE index performance on BRICS index returns. The monthly index returns are calculated as the difference between current month-end index price and previous month-end stock price divided by previous month-end index price.

3.2.2 GDP growth rate

Real economic activity explains a larger fraction of variations in stock market returns for longer time horizon. In an earlier study, Fama (1990) reports that changes in the rate of production growth significantly increases the variations in both monthly and annual stock returns of New York Stock Exchange. Likewise, Remonola (1990) shows that real domestic growth rates have critical influences on excess stock market returns in developed countries. Using rolling-correlation analysis, Lyoksa (2014) finds that although the growth-return relationship is positive in the case of several central and eastern European economies, the strength of this relationship varies during the period of financial crisis. In the context of OECD countries, Madsen et al. (2013) also find that the relationship between stock returns and economic growth is significantly positive. Several other papers argue that financial development increases as the demand for financial services grows, which is directly tied to economic growth of a country (e.g., Stern, 1989). Given that BRICS economies are growing at a high rate compared to many developed countries, it is expected that such positive growth in economic activities result in high demand for investments in BRICS stock markets, and thus incurs positive index returns in these markets. For instance, Jefferis and Okeahalam (2000) study the relationship between stock returns and selected macroeconomic variables for three African economies including South Africa. They find that South African index returns are positively affected by its GDP growth rate. Similar evidence is also found in the case of South Africa by Hsing (2011). I, therefore, consider GDP growth as a critical indicator to determine stock market index performance for BRICS countries and expect a positive relationship between them. I measure this variable as (GDP in year t – GDP

in year *t-1*)/GDP in year t-1, which is converted to monthly GDP growth rate by dividing the annual rate by the number of months in a year.[12]

3.2.3 Nominal interest rate

The role of nominal interest rate cannot be overemphasized in an economy. This is because the impact of interest rate on stock market indices provides important implications for government policies for financial market and monetary policies (Alam and Uddin, 2009). A number of studies have examined the interrelationship between nominal interest rate and stock market returns. For instance, Harasty and Roulet (2000) examine seventeen developed countries and showed that stock prices are cointegrated with long term interest rate in each country. Chinzara (2011) and Hsing (2011) are some of the many studies that examine the relationship between selected macroeconomic variables and stock prices. The studies indicate that interest rate is among the most influential variables that plays a role in affecting stock markets in an emerging economy. Empirical studies exhibit that there is, in general, an inverse relationship between stock prices and interest rate. For example, using a structural VAR model, Hsing (2014) find that stock prices increased in Estonian stock market due to decrease in own interest rate during the first quarter of 2000 and third quarter of 2013. Other studies consistent with this finding include Jefferis and Okeahalam (2000), Pimentel and Choudry (2014), Fifield et al. (2002) amongst others. These papers consider some of the BRICS countries (South Africa, Brazil) in their studies. According to them, an increase in nominal interest rate decreases stock index returns in those countries. Some other studies, however, report mixed evidence on the relationship between stock market returns and interest rates for different economies. For instance, Wongbangpo and Sharma (2002) observed that a negative long run relationship exists between stock prices and

[12] To maintain consistency in time interval across individual variables, I choose yearly data.

interest rate for Philippines, Singapore and Thailand while a positive relationship is observed in Indonesia and Malaysia. Therefore, the relationship between interest rate and stock index returns is inconclusive – differs from country to country. In this thesis, I use monthly interest rates for each BRICS country, obtained from the World Bank's World Economic Indicators.

3.2.4 Exchange rate

A change in the exchange rate signals important changes in the international trade patterns of an economy, and such information is then transmitted to stock prices (Zhao, 2010). Generally, when the U.S. dollar depreciates (appreciates), profit levels are likely to rise (fall) in export-oriented U.S. firms as their total exports increase. Due to increases (decreases) in profits, company's stock price also starts increasing (decreasing). Therefore, the degree of exchange rate flexibility has a role to play in determining stock price changes (e.g. Phylaktis and Ravazzolo, 2005). Previous studies have empirically investigated this relationship between the domestic stock market and the foreign exchange market. While some of them have found evidence of a negative relationship, others have, however, reported no relationship between these two markets. For example, Kim (2003) considers several determinants including real U.S. dollar exchange rate to determine its impact on stock price movements. The author measures exchange rate as the number of foreign currency units per U.S. dollar so that a rising exchange rate means appreciation of the dollar. He finds a negative relation between U.S. stock price and U.S. dollar exchange rates. The author argues that investors want to shift from foreign to American stocks, thereby putting pressures on the dollar exchange rate to appreciate. This causes in U.S. equity prices to increase. Likewise, some other recent studies have found a negative relationship between exchange rate fluctuations and stock returns in emerging markets (e.g., Hsing, 2011; Basher, Haug, and Sardosky, 2012). In contrast, Chiang and Yang (2003) investigate the

relationship between stock returns and currency values for nine Asian markets and find evidence of a positive relationship in all markets. They measure exchange rate as weekly Friday closing quotations which are expressed in national currency units (NCU) per U.S. dollar. They are of the opinion that relative stock return volatility effectively summarizes relative market risk, which is compensated by the speculative profit from the foreign exchange market. However, Chkili and Nguyen (2014) show that the impact of exchange rate movements is not significant for all BRICS stock markets. Gay (2008) also finds no relationship between BRIC stock markets and exchange rate. He is of the opinion that this is not unexpected as other international and domestic macroeconomic variables like production, inflation, and interest rates have a role in determining future stock prices and since these economic indicators are also influenced by exchange rate changes the effect of foreign exchange rate on stock price movements is captured by those macroeconomic fundamentals. Therefore, I find inconclusive evidence about the effect of exchange rate fluctuations on stock returns across individual countries. Following earlier studies, monthly exchange rate is measured as each country's currency per U.S. dollar in this thesis, obtained from the OANDA database.

3.2.5 Financial crisis

The Federal Reserve Board of St. Louis (2009) and the Bank for International Settlements (2009) identify four different phases of the most recent global financial crisis. According to these studies, the timeline of the global financial crisis is categorized into four phases. Phase 1 is described as "initial financial turmoil" which spans from 1 August 2007 to 15 September 2008. Phase 2 is defined as "sharp financial market deterioration" and spans from 16 September 2008 to 31 December 2008. Phase 3 is identified as "macroeconomic deterioration", which spans from 1 January 2009 to 31 March 2009. Finally, Phase 4 is considered as an episode of "stabilization

and tentative signs of recovery" (generally referred as post-crisis period), which spans from 1 April 2009 to March 2010 when equity prices around the world gained strongly [13] (Mighri and Mansouri, 2014). In most studies (e.g., Dimitriou et al., 2013; Bekiros, 2014; Syllignakis and Kouretas, 2011; Aloui et al., 2011 amongst others), the crisis period is however assumed to be the time frame covering the first three phases (from 1 August 2007 to 31 March 2009). In this thesis, I identify the global financial crisis by a dummy variable (ECRISIS). By definition, ECRISIS is equal to 1 if any month of the sample period lies in between August 2007 and March 2009, 0 otherwise. Some of the BRICS countries also experienced similar type of adverse financial shock during the sample period. The major financial crises that hit BRICS stock markets are as follows:

Brazil: Introduction of the new Brazilian currency, *Real,* on July 1, 1994 was expected to put an end to high inflation that affected their economy over the previous three decades. It was expected to be fixed at 1:1 with the U.S. dollar, but unfortunately it suffered a sudden devaluation to a rate of about 2:1 in 1998 (Pinheiro et al., 2001). The beginning of this crisis was followed by high gross external debt to about US$228 billion (over 28 percent of GDP) by mid-1998 according to IMF report (November 1998). Towards the end of November 1999 the Brazilian economy began to recover and foreign direct investment increased after the devaluation to a high of 2000 (Evangelist and Sathe, 2006).In the thesis, I identify the country-specific financial crisis period for Brazil from July 1998 to November 1999.

Russia: As of August 17, 1998, the Russian currency crisis and default of Russian government bonds, also known as *Ruble* crisis or the Russian Flu, hit the country and forced the government to devalue the currency, *Ruble* (Wiel, 2013). The crisis was, however, for a shorter period of

[13] Refer to 2010 Bank of International Settlement (Annual Report).

time ending February of the following year. This recovery was partly because of the rise in world oil price in 1999 when Russia experienced a large trade surplus. Further, an infusion of cash by IMF and World Bank helped the Russian economy to recover. In the thesis, I identify the country-specific financial crisis period for Russia from August 1998 to February 1999.

***India**:* The crisis that affected most part of Asian markets also had effect on the Indian stock market. The Asian financial crisis which started July 1997 originated from Thailand (Kenourgious et. al., 2011). The crisis started when the Thai government was forced to float the *Thai baht* due to lack of foreign exchange currency in order to support its fixed exchange rate. In the thesis, I identify country-specific financial crisis period for India from July 1997 to February 1998.

***China**:* China also experienced a major financial crisis as a result of the Asian financial crisis that started July 1997 (Kenourgious et. al., 2011). The Chinese economy was highly impacted by the crisis due to its large foreign investment. By February 1998, financial intervention from the IMF and the World Bank restored market confidence in some of the affected countries, especially Thailand. As a result, China also recovered from the crisis at that time.In the thesis, I identify country-specific financial crisis for China from July 1997 to February 1998.

***South Africa**:* According to Bhundia and Ricci (2005), the currency crises spread from the end of April 1998 to the end of August 1998, and again in between September 2001 and December 2001. In another study, Aron and Muellbauer (2005) identify several currency crises in February 1996, in October 1996, November 1997 and April 1998. However, they do not consider the 2001 "event" as a currency crisis.

Data reveals that most of these emerging countries experienced their respective financial crises almost at the same time between 1997 and 1999, except South Africa where a second financial crisis occurred for a short period of time during the end of 2001. Hence, I consider BRICS-specific financial crises as a cluster of individual crises that happened during the same time in all these countries. In empirical models, I capture such a common period of financial crises that were faced by BRICS economies as a group by a variable, called BRICS-CRISES. By definition, BRICS-CRISES equals to 1 if any month of the sample period belongs to the months of a financial crisis in a particular country as stated above, 0 otherwise. For example, since stock markets in China were adversely affected from July 1997 to February 1998, BRICS-CRISES for China equals to 1 for these months, 0 otherwise in case of China.

3.3 Estimation methods

Time series regression models have been widely used in estimating the relationship between stock market returns and macroeconomic variables in previous studies. This thesis has employed panel regression methods. The coefficients of all variables included in empirical models are initially estimated considering both fixed and random effects. The general pooled OLS (Ordinary Least Squares) method which has no country-specific attribute in the regression or universal effect across time is also included in the thesis to understand whether index returns across BRICS countries are significantly different among these countries. In this regard, country dummy variables are included in the model.

3.3.1 Fixed effects method

This method is simply a linear regression model in which the intercept terms vary over the individual units, *i*. It can be represented as:

$$y_{it} = \mu_i + \beta X_{it} + \varepsilon_{it} \qquad t=1,\ldots T \qquad (3.1)$$

Where y_{it} *= the dependent variable;*

μ_i *= individual effect of each unit;*

X_{it} *= the independent variables;*

β *= the regression parameters;*

ε_{it} *= the error term*

i and t are indices for individual unit and time, respectively.

It is usually assumed that all X_{it} are independent of all ε_{it}. Essentially, the fixed effects model concentrates on differences 'within' group (Verbeek, 2000).The parametric assumptions about βimpose that a change in X_{it} has the same effect whether it is a change from one period to the other or a change from one individual variable to the other (Verbeek, 2000).

3.3.2 Random effects method

Generally, it is assumed that all factors that affect the dependent variable in a regression analysis, but have not been included as regressors, can be appropriately summarized by a random error term. This leads to the assumption that the β_i are random factors, independently and identically distributed over individuals. Therefore, the random effects models can be written as:

$$y_{it} = \mu + \beta X_{it} + \alpha_i + \varepsilon_{it} \qquad t=1,\ldots T \qquad (3.2)$$

Where $(\alpha_i+\varepsilon_{it})$ is treated as an error term consisting of two components: an individual unit specific component that does not vary over time and a remainder component that is assumed to be uncorrelated over time. This implies that all correlation of the error terms over time is

attributed to the individual effects, α_i (Verbeek, 2000, pp. 315). The error components structure implies that the composite error term, $(\alpha_i + \varepsilon_{it})$ exhibits a particular form of autocorrelation. Since it is assumed that α_i and ε_{it} are mutually independent and identical of x_{js} (for all j and s), the OLS estimator for μ and β_t from (*3.2*) is unbiased and consistent. However, routinely computed standard errors for the OLS estimator are incorrect. Hence, a more efficient General Least Squares (GLS) estimator can be obtained from random effects method (Verbeek, 2000). E-views[14] statistical software is used to estimate the coefficient of parameters in the models.

3.4 Empirical models

In order to examine the effect of the U.S. stock market and financial crises on the BRICS stock market performance, several regression models have been estimated. Different model specifications are estimated for robustness check of our findings. Each specification includes control variables to absorb country-specific differences in macroeconomic, money market, and foreign exchange market performances over time. Literature shows that slow diffusion of information is a leading cause of the lead-lag effect in stock returns (Hou, 2007; Gebka, 2008). Hence, one-month lag of BRICS stock index returns are also included in empirical models. Also, an interaction term between the U.S. stock index returns and the global financial crisis is included in the models so as to determine how the U.S stock market performance during the global financial crisis affected BRICS index returns. On the contrary, an interaction term between the U.S. stock index returns and BRICS-specific crises is considered in order to absorb the role of U.S. stock market during the period of BRICS-specific crises. A general model that is used in the paper is defined as follows:

[14]E-views software is provided through the portal of the University of Northern British Columbia (UNBC), Canada.

Model 1: Based on the U.S. global financial crisis

$$r_{i,t} = \beta_0 + \beta_1 USINDEX_{i,t} + \beta_2 ECRISIS_{i,t} + \beta_3 (USINDEX*ECRISIS)_{i,t} + \beta_4 GDPGR_{i,t} + \beta_5 INT_{i,t} + \beta_6 EXCH_{i,t} + \beta_7 r_{i,t-1} + \varepsilon_{i,t} \quad (3.4.1)$$

Model 2: Based on BRICS-specific financial crises

$$r_{i,t} = \beta_0 + \beta_1 USINDEX_{i,t} + \beta_2 BRICS\text{-}CRISES_{i,t} + \beta_3 (USINDEX*BRICS\text{-}CRISES)_{i,t} + \beta_4 GDPGR_{i,t} + \beta_5 INT_{i,t} + \beta_6 EXCH_{i,t} + \beta_7 r_{i,t-1} + \varepsilon_{i,t} \quad (3.4.2)$$

Model 3: Based on both U.S. and BRICS-specific financial crises

$$r_{i,t} = \beta_0 + \beta_1 USINDEX_{i,t} + \beta_2 ECRISIS_{i,t} + \beta_3 BRICS\text{-}CRISES_{i,t} + \beta_4 (USINDEX*ECRISIS)_{i,t} + \beta_5 (USINDEX*BRICS\text{-}CRISES)_{i,t} + \beta_6 GDPGR_{i,t} + \beta_7 INT_{i,t} + \beta_8 EXCH_{i,t} + \beta_9 r_{i,t-1} + \varepsilon_{i,t} \quad (3.4.3)$$

Where:

$r_{i,t}$ *represents BRICS stock index returns at month t*

$USINDEX_{i,t}$ *represents U.S. stock index returns at month t,*

$ECRISIS_{i,t}$ *represents a dummy variable capturing global financial crisis at month t*

$BRICS\text{-}CRISES_{i,t}$ *represents dummy variable capturing BRICS crises at month t*

$USINDEX_{i,t}*ECRISIS_{i,t}$ *is an interaction term between the U.S. stock index returns and global financial crisis at month t*

$USINDEX_{i,t}*BRICS\text{-}CRISES_{i,t}$ *is an interaction term between the U.S. stock index returns and BRICS-specific crises at month t*

$GDPGR_{i,t}$ *represents GDP growth rate of each country at month t*

$INT_{i,t}$ *represents nominal interest rate of each country at month t*

$EXCH_{i,t}$ represents exchange rate per U.S. dollar of each country at month t

$r_{i,t-1}$ represents one-month lagged index returns of the BRICS stock market at month t

For robustness of my findings, an alternative variable (export growth rate) instead of GDP growth rate is included in the above models. The export growth rate is initially measured as: (export in year *t* – export in year *t-1*) / export in year t-1 and then, is converted to monthly export growth rate by dividing the annual rate by the number of months in a year. Several robustness tests of empirical findings are also conducted as discussed in the following chapter.

3.5 Diagnostic tests

It is important to know which of the panel regression methods best explains the objective of this thesis. This is why some specification tests will be carried out to determine the best method. Hausman (1978) suggested a test for the null hypotheses of panel data that X_{it} *and* β_i are uncorrelated. The general idea of a Hausman test is that two estimators are compared: one which is consistent under both the null and alternative hypothesis and one which is consistent (and typically efficient) under the null hypothesis only. A significant difference between the two estimators indicates that the null hypothesis is unlikely to hold. The Hausman test is used in this thesis, thus tests whether the fixed effects and random effects estimator are significantly different. This thesis uses OLS estimator and thus R-squared will be used to compute goodness-of-fit. The accuracy of the models' specifications is also examined. F-statistics corresponding to a null hypothesis that the proposed regression models fit the data well is therefore computed for each model specification. Other preliminary tests that are carried out on the data series include normality test (by observing the Jarque-Bera values) and panel unit root test (by Im, Pesaran and Shin, 2003). It is necessary to carry out the unit root tests so as to determine if the panel data

series are non-stationary. These tests are carried out and discussed in the next chapter of this thesis.

CHAPTER FOUR

EMPIRICAL RESULTS

This chapter presents results of the empirical analysis based on the panel dataset highlighted in chapter 3. The first section of this chapter presents both descriptive statistics of the panel data and graphical representation of BRICS and U.S. stock index returns. Section 4.2 shows correlation between monthly index returns for BRICS and U.S. stock markets as well as selected macroeconomic indicators. Section 4.3 presents regression outputs with different model specifications and section 4.4 provides summary of findings.

4.1 Descriptive Statistics

Table 4.1 reports summary statistics of monthly panel data used in this thesis while Figure 1 shows the panel data series plots of index returns (SINDEX and USINDEX). As shown in table 4.1, BRICS stock index returns (SINDEX) have a mean value of 0.011, which is larger than that of the US stock index returns (USINDEX) of 0.007. This implies that investing in BRICS stock markets generates higher returns to investors. However, the level of risk in investing in these markets is also higher than that of the U.S. market (0.104 versus 0.044). Data also reveals that while investors' range of returns from investment in BRICS stock markets varies from -39.4% to 54.7%, return on investment fluctuates in between -19.5% and 11.4% in case of the U.S. market. This finding coincides with the principle of risk-return trade off, suggesting that higher returns from investment in the BRICS stock markets are also followed by higher potential risks involved in these emerging markets.

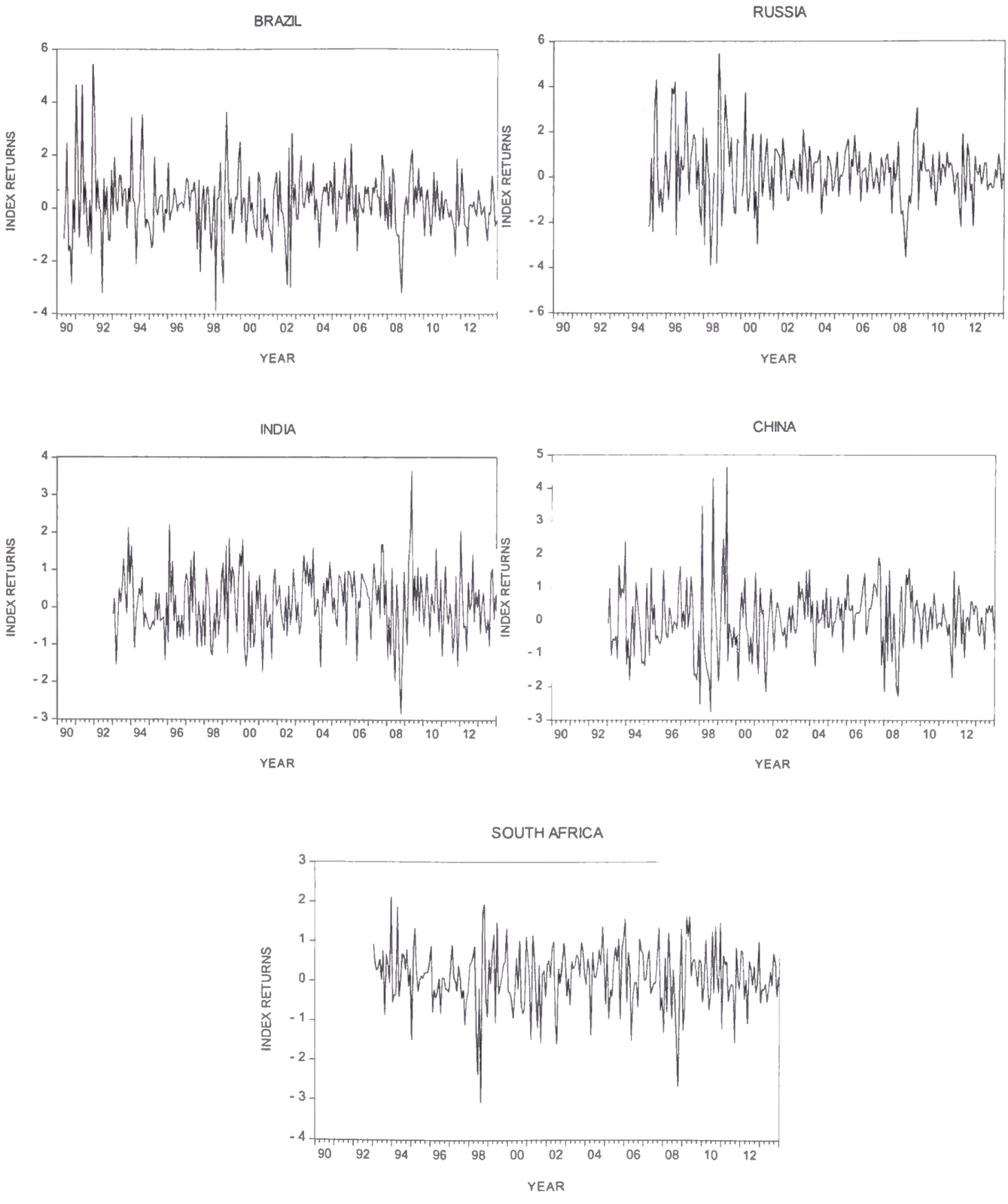
Table 4.1: Summary statistics of monthly panel data

	SINDEX	USINDEX	GDPGR	EXP_GR	INT	EXCH
Mean	0.011	0.007	0.450	0.011	1.707	140.228
Maximum	0.547	0.114	1.187	0.076	22.477	5942.919
Minimum	-0.394	-0.195	-0.652	-0.029	0.167	0.961
Std. Dev.	0.104	0.044	0.327	0.014	1.998	804.244
Skewness	0.171	-0.791	-0.340	0.626	4.135	6.434
Kurtosis	5.414	4.949	3.739	6.708	33.969	42.719
Observations	1174	1174	1174	1174	1174	1174

The measure of skewness shows that the U.S. stock index returns and GDP growth rate (GDPGR) are negatively skewed and thus skewed to the left while other variables are skewed to the right. From observing the excess kurtosis (which is above 3), the leptokurtic behavior is apparent in all series and more evident fat tails in exchange rate (EXCH). This implies that the panel data series are not normally distributed. This is not surprising given that the panel data have been constructed by compiling financial and economic data from five different emerging countries with distinctive characteristics. Further, the Jarque-Bera (JB) test statistics reject the normality of the distribution for index return series. The panel unit root test is also used to check if stock index return series are stationary by applying IPS (Im, Pesaran and Shin, 2003) panel unit root test. This test allows for heterogeneity in intercepts as well as slope coefficients (Pradhan et al., 2013). The IPS unit root test verifies the null hypothesis of unit root for index return series in the panel. The values in the statistics allow for the rejection of the null hypothesis at the 1% level of significance implying that all return series are stationary. As such, lag return series is considered while estimating coefficients of empirical models. Heteroskedasticity consistent coefficients have also been estimated for empirical models.

Figure 1 presents the plots of stock index returns for the BRICS countries. Time series plot is used here for individual country so as to show the periods of financial crisis. High fluctuations in index return series as shown in the graphs can be associated with individual country crisis during the sample period. Notably, each of the BRICS countries experienced financial crisis at a particular point in time. For example, the 1997/1998 Asian financial crisis affected Chinese stock market the most which significantly affected Chinese economy during that period. Likewise, Brazil, India, Russia and South Africa experienced high stock returns volatility during the same time. Country-specific study reports that risk of potential investment in all BRICS stock markets exponentially increased during the period 1997-1998, and this uncertainty in these markets at that particular time are associated with their own financial problems (as stated in section 3.2.5).Data reveals that the standard deviation of BRICS index returns increased from 7.9% in 1995-1996 to 13.5% in 1997-1998. As also reflected in the graphs, BRICS index returns fluctuated significantly during the period of global financial crisis in 2007-2008 - the standard deviation of BRICS index returns series increased from 7.5% in 2005-2006 to 11.6% in 2007-2008. This suggests that financial crisis in the U.S. has also a subsequent impact on stock market performance in the BRICS countries.

Figure 1: Time series distribution of index return series of BRICS countries



4.2 Correlation between BRICS index returns, U.S. index returns and macroeconomic variables

Table 4.2 below shows the correlation between BRICS stock index returns and individual macroeconomic variables including U.S. index returns. The correlation shows significant relationships among some of these variables. For instance, BRICS stock index returns are significantly and positively correlated with the U.S. stock index returns. The corresponding correlation is 0.551, significant at the 1% level, suggesting that stock returns in both U.S. and BRICS markets move together in the same direction. In other words, if the U.S. stock market does well, other stock markets in the BRICS also perform well and vice versa. Among all economic indicators, exchange rate is significantly correlated with index returns in both U.S. and BRICS markets, and thus foreign exchange market plays an important role to determine potential returns on investment in stock market. Given the fact that foreign capital flows between the U.S. and BRICS markets are increasing over time, such interaction between two markets is not unlikely. Correlation estimations also reveal that individual macroeconomic variables are highly correlated. For example, export growth is significantly and negatively correlated with both interest rate and exchange rate (-0.248 and -0.171, significant at 1% level, respectively), but most strongly and positively correlated with GDP growth rate (0.648, significant at the 1% level) of an economy. GDPGR, on the other hand, is negatively correlated with interest rate (INT) and exchange rate (EXCH) at -48% and -25.6%, respectively. This implies that overall performance of both money market and foreign exchange market is critical for economic growth of a country. Likewise, the latter two markets are also connected to each another as the correlation between INT and EXCH is found positive and significant at the 1% level (i.e., correlation is 0.435). In summary, it can therefore be argued that economic performance of a country, volume of

commodity trading, activities in both money market and foreign exchange market could be possible explanations for understanding stock market performance, in general.

Table 4.2: Correlation between monthly BRICS stock index returns and macroeconomic Variables

Variables	SINDEX	USINDEX	GDPGR	EXP_GR	INT	EXCH
SINDEX	1.000					

USINDEX	0.551***	1.000				
	(22.620)	-----				
GDPGR	0.045	0.032	1.000			
	(1.558)	(1.094)	-----			
EXP_GR	-0.026	-0.031	0.648***	1.000		
	(-0.879)	(-1.058)	(29.101)	-----		
INT	0.095***	0.044	-0.480***	-0.248***	1.000	
	(3.255)	(1.507)	(-18.722)	(-8.765)	-----	
EXCH	-0.082***	-0.069***	-0.256***	-0.171***	0.435***	1.000
	(-2.803)	(-2.366)	(-9.081)	(-5.937)	(16.536)	-----

***,**, and * indicate the significance of each pair of correlation at the 1%,5%, and 10% level, respectively.

4.3 Regression results

A number of models have been estimated for the purpose of this thesis in order to obtain accurate basis for the relationship between BRICS index returns and U.S. stock index returns. The results are estimated based on three regression methods which are: pooled ordinary least square, fixed effects and random effects panel regression methods. The estimated coefficients, t-statistics, F-statistics, and Hausman test are also presented in the tables.

Table 4.3: Panel Regression (BRICS): Global Financial Crisis versus BRICS-specific financial Crises Using Pooled OLS

Variables	PANEL A: U.S. GLOBAL FINANCIAL CRISIS				PANEL B: BRICS FINANCIAL CRISES			
	MODEL 1	*MODEL 2*	*MODEL 3*	*MODEL 4*	*MODEL 5*	*MODEL 6*	*MODEL 7*	*MODEL 8*
USINDEX	1.352*** (22.665)	1.346*** (22.533)	1.309*** (19.563)	1.297*** (19.356)	1.322*** (22.854)	1.315*** (22.732)	1.270*** (21.298)	1.264*** (21.182)
ECRISIS	0.020** (2.203)	0.020** (2.225)	0.025** (2.550)	0.025*** (2.627)	-	-	-	-
BRICS-CRISES	-	-	-	-	-0.015 (-1.281)	-0.019* (-1.601)	-0.025** (-2.068)	-0.028** (-2.376)
USINDEX* ECRISIS	-	-	0.212 (1.426)	0.238* (1 604)	-	-	-	-
USINDEX* BRICS-CRISES	-	-	-	-	-	-	0.757*** (3.311)	0.750*** (3.285)
GDPGR	0.014 (1.162)	-	0.013 (1.051)	-	0.014 (1 120)	-	0.015 (1.217)	-
EXP_GR	-	-0.273 (-1.404)	-	-0.293 (-1.504)	-	-0.323* (-1.643)	-	-0.325* (-1.659)
INT	-0.000 (-0.085)	-0.001 (-0.587)	0.000 (-0.102)	-0.001 (-0.591)	0.000 (0.180)	0.000 (-0.227)	0.000 (0.182)	0.000 (-0.248)
EXCH	0.000** (2.223)	0.000** (2.005)	0.000** (2.232)	0.000** (2.022)	0.000* (1.927)	0.000* (1.639)	0.000** (2.008)	0.000* (1.706)
INDEX(-1)	0.031 (1.267)	0.030 (1.224)	0.028 (1.143)	0.026 (1.079)	0.025 (1.031)	0.023 (0.967)	0.026 (1.079)	0.024 (1.015)
Brazil	0.003 (0.302)	0.006 (0.638)	0.003 (0.313)	0.006 (0.647)	0.005 (0.457)	0.008 (0.837)	0.005 (0.541)	0.009 (0.935)
Russia	0.008 (0.896)	0.011 (1.284)	0.008 (0.914)	0.011 (1.298)	0.008 (1.004)	0.012 (1.430)	0.008 (0.933)	0.012 (1.377)
India	-0.005 (-0.527)	0.002 (0.217)	-0.004 (-0.480)	0.002 (0.235)	-0.004 (-0.423)	0.003 (0.375)	-0.004 (-0.491)	0.003 (0.350)
China	-0.014 (-1.349)	-0.003 (-0.390)	-0.013 (-1.277)	-0.003 (-0.364)	-0.013 (-1.220)	-0.001 (-0.170)	-0.014 (-1.307)	-0.002 (-0.196)
CONSTANT	-0.005 (-0.713)	0.001 (0.245)	-0.004 (-0.590)	0.002 (0.353)	-0.003 (-0.496)	0.003 (0.514)	-0.003 (-0.493)	0.003 (0.578)
Sample size	1174	1174	1174	1174	1174	1174	1174	1174
R-Square	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
F-Statistics	55.298***	55.390***	50.501***	50.657***	54.826***	55.039***	51.267***	51.439***

***, **, and * indicate the significance of each coefficient at the 1%, 5%, and 10% level, respectively. T-statistics are given in the parentheses.

Table 4.3 presents regression output using pooled OLS regression method and South Africa as a base country. The table is divided into two sections based on two individual types of crises. Panel A includes estimated coefficients of individual variables using the U.S. financial crisis as a proxy for global financial crisis, and Panel B reports estimated results using BRICS-specific financial crises. For all models, it is evident that the relationship between U.S. index returns and BRICS index returns is significant and positive at the 1% level. This implies that index returns in both markets move in the same direction, and thus there is a subsequent effect from the U.S. market to BRICS stock markets. As an example, the coefficient of USINDEX in model 1 of panel A is 1.352, suggesting that 1% increase in U.S. index returns result in 1.352% increase in returns of BRICS index. The results also exhibit that ECRISIS is positively significant in all models in panel A. This implies that index returns in BRICS stock markets increased during the recent global financial crisis in the U.S. compared to non-crisis periods. Panel B includes BRICS-CRISES instead of ECRISIS, and exhibits that BRICS index returns are adversely affected during the period of own BRICS-specific financial crises compared to other non-crisis periods (the coefficient of BRICS-CRISES varies from -0.019 to -0.028). In models 3 and 4 of panel A (7 and 8 in panel B), I consider an interaction term between U.S. stock index returns and financial crises (either USINDEX*ECRISIS or USINDEX*BRICS-CRISES). Estimated results show that the coefficient of USINDEX*BRICS-CRISES is always highly significant and positively correlated with BRICS index returns. For example, as shown in model 7 in panel B, 1% increase in USINDEX returns resulted in 0.757% increase in BRICS index returns during the period of financial crisis in respective countries compared to non-crisis periods, significant at the 1% level. On the contrary, similar model specification, as shown in model 3 of panel A, exhibits that the coefficient of USINDEX*ECRISIS is insignificant, suggesting that change in U.S. index

returns during the U.S. financial crisis did not have any significant impact on index returns in BRICS countries.

Furthermore, amongst the four own macroeconomic variables, exchange rate (EXCH) is persistently significant across all model specifications. Though the coefficient of EXCH is economically negligible, this is significant at the 1% level, suggesting that depreciation of local currency has a positive impact on domestic index returns of BRICS countries. This is not unlikely given that as local currency depreciates, domestic stocks become cheaper to foreign investors. Due to large foreign capital inflows, current demand for domestic stocks increases and thus stock prices begin to rise. Nonetheless, the evidence suggests that the subsequent effect of local currency depreciation on return on investment in stock markets is minimal in case of BRICS countries. Finally, BRICS-specific dummy variables are always found insignificant, suggesting that stock index returns in BRICS are not significantly different from each another. As such, I consider returns of all BRICS indices together in a panel data set, clustered by individual country, to distinguish the responsiveness of emerging stock markets' performance to both global and BRICS-specific financial crises.

Table 4.4: Panel Regression (BRICS): Global Financial Crisis Using Fixed and Random Effects Methods

Variables	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	FIXED EFFECTS	*RANDOM EFFECTS*	*FIXED EFFECTS*	*RANDOM EFFECTS*	*FIXED EFFECTS*	*RANDOM EFFECTS*	*FIXED EFFECTS*	*RANDOM EFFECTS*
USINDEX	1.352*** (22.665)	1.349*** (16.307)	1.346*** (22.532)	1.341*** (16.158)	1.309*** (19.563)	1.299*** (14.013)	1.297*** (19.356)	1.286*** (13.834)
ECRISIS	0.020** (2.203)	0.020 (1.583)	0.020** (2.225)	0.020 (1.549)	0.025** (2.550)	0.026* (1.895)	0.025*** (2.627)	0.026* (1.892)
USINDEX* ECRISIS	-	-	-	-	0.212 (1.426)	0.251 (1.216)	0.238 (1 604)	0.271 (1.306)
GDPGR	0.014 (1.162)	-0.004 (-0.532)	-	-	0.013 (1.051)	-0.005 (-0.577)	-	-
EXP_GR	-	-	-0.273 (-1.404)	-0.461** (-2.168)	-	-	-0.293 (-1.504)	-0.475** (-2.232)
INT	0.000 (-0.085)	0.000 (0.237)	-0.001 (-0.587)	0 000 (0.127)	0.000 (-0.102)	0.000 (0.223)	-0.001 (-0.591)	0.000 (0.122)
EXCH	0.000** (2.223)	0.000*** (3.487)	0.000** (2.005)	0.000*** (3.349)	0.000** (2.232)	0.000*** (3.501)	0.000** (2.022)	0.000*** (3.361)
INDEX(-1)	0.031 (1.267)	-0.003 (-0.111)	0.030 (1.224)	-0.006 (-0.225)	0.028 (1.143)	-0.005 (-0.194)	0.026 (1.079)	-0.008 (-0.315)
CONSTANT	-0.007 (-0.906)	0.001 (0.134)	0.004 (0.887)	0.005 (0.887)	-0.006 (-0.753)	0.002 (0.248)	0.005 (1.040)	0.005 (1.026)
Sample size	1174	1174	1174	1174	1174	1174	1174	1174
R-Square	0.32	0.20	0.32	0.20	0.32	0.20	0.32	0.20
F-Statistics	55.298***	48.804***	55.390***	49.338***	50.501***	42.000***	50.657***	42.530***
Hausman Test (p-value)	-	14.137*** (0.007)	-	16.226*** (0.003)	-	13.258*** (0.010)	-	15.365*** (0.004)
Country-specific Effects	**B**-0.005 **R**-0.009 **I**-(0.003) **C**-(0.012) **S**-0.002	-	**B**-0.003 **R**-0.008 **I**-(0.001) **C**-(0.006) **S**-(0.003)	-	**B**-0.005 **R**-0.009 **I**-(0.003) **C**-(0.012) **S**-0.002	-	**B**-0.003 **R**-0.008 **I**-(0.001) **C**-(0.006) **S**-(0.003)	-

***,**,* imply the significance of each coefficient at the 1%, 5% and 10% level, respectively. T-statistics corresponding to coefficients are in parenthesis.

Table 4.4 presents estimated results using fixed and random effects panel regression methods. This table has four model specifications capturing the effect of global financial crisis on the BRICS index returns. The conventional Hausman test is carried out for all model specifications. The test statistics varies from 13.258 in model 3 to 16.226 in model 2, significant at the 1% level, suggesting that fixed effects method is an appropriate model specification for estimating the coefficients of individual models. Similar to the results in table 4.3, the relationship between U.S. stock index returns and BRICS stock index returns is found significant and positive at the 1% level, repeatedly suggesting that index returns of both U.S. and BRICS markets move in the same direction, and thus there is a subsequent effect from the U.S. market to BRICS stock market. As the results suggest, the global financial crisis (ECRISIS) is significant in all model specifications using fixed effects method. For example, model 3 exhibits that during the global financial crisis BRICS stock index returns increased. The coefficient value suggests that BRICS stock index returns were increased by 0.025% during the period of U.S. global financial crisis compared to non-crisis period. Results also show that the coefficient of (USINDEX*ECRISIS) is insignificant suggesting that decrease in US index returns did not have any adverse effect on BRICS index returns. In addition, exchange rate (EXCH) is the only macroeconomic variable that is found significant under both fixed and random effects. However, the coefficient of EXCH presents no economic value. It however proposes that depreciation of local currency has positive effect on current stock index returns of BRICS countries. This is consistent with the findings of Chiang and Yang (2003).The insignificant interest rate (INT) is consistent with the findings of Binti et. al (2011).

Table 4.5: Panel Regression (BRIC): Global Financial Crisis Using Fixed Effects Method

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4
USINDEX	1.404*** (19.709)	1.396*** (19.558)	1.372*** (17.153)	1.357*** (16.917)
ECRISIS	0 022** (1.973)	0.022** (1.984)	0.025** (2.151)	0.026*** (2.220)
USINDEX* ECRISIS	-	-	0.155 (0.878)	0.187 (1.059)
GDPGR	0 015 (1.109)	-	0.014 (1.044)	-
EXP_GR	-	-0.338 (-1.521)	-	-0.354 (-1.588)
INT	0.000 (0.080)	-0.001 (-0.425)	0.000 (0.068)	-0.001 (-0.429)
EXCH	0.000** (1.966)	0.000* (1.721)	0.000** (1.973)	0.000* (1.734)
INDEX(-1)	0.040 (1.462)	0.039 (1 407)	0.038 (1.383)	0.036 (1.307)
CONSTANT	-0.009 (-0.965)	0.005 (0 847)	-0.008 (-0.872)	0.006 (0.950)
Sample size	920	920	920	920
R-Square	0.31	0.31	0.31	0.31
F-Statistics	46.955***	47.131***	42.326***	42.536***
Hausman Test (p-value)	13.422*** (0.009)	14.133*** (0.007)	12.878*** (0.012)	13.585*** (0.009)
Country-specific Effects	**B-** 0.005 **R-** 0.010 **I-** (0.002) **C-** (0.011)	**B-** 0.002 **R-** 0.007 **I-** (0.002) **C-** (0.006)	**B-** 0.005 **R-** 0.010 **I-** (0.002) **C-** (0.011)	**B-** 0.002 **R-** 0.007 **I-** (0.002) **C-** (0.006)

***,**,* imply the significance of each coefficient at the 1%, 5% and 10% level, respectively. T-statistics corresponding to coefficients are in parenthesis.

Table 4.5 presents similar model specifications as in table 4.4 using only fixed effects method since Hausman test indicates that the method is appropriate for estimating the coefficients of individual models. The estimation results obtained here, however, exclude South African data in the panel dataset. Since South Africa became a member of BRICS in 2010, it is important to know whether the previous findings in table 4.4 are somehow influenced due to inclusion of a new member country almost at the end of our sample period. The coefficients of the relationship between BRIC index returns (without South Africa) and U.S. index returns remain significant and positive. This suggests that even after excluding South Africa, stock index returns in other four emerging countries also exhibit significantly higher returns when index returns increase in the U.S. stock market. For example, model 1 shows that a percentage increase in U.S. index returns results in 1.404% increase in BRIC index returns. Similar to the finding in Table 4.4, the coefficient of ECRISIS remains significantly positive across all model specifications, suggesting that BRIC index returns indeed improved during the crisis time compared to non-crisis period in the U.S. This is not unlikely given that when the U.S. stock market underperformed particularly during the crisis period in 2007-2008, American investors' holding of foreign stocks significantly increased, and other foreign investors also became cautious for investing in the U.S stock market. On the contrary, BRIC stock markets became able to attract more foreign investors to invest in their stocks during that time. As a result, there was a high demand of BRIC stocks, and this resulted in subsequent upward pressure on stock prices. As such, it is likely that market index returns improve in BRIC stock markets when the alternative market, which is the U.S. in this case, went through financial uncertainty. The result further shows that the interaction term between U.S. stock index returns and global financial crisis (USINDEX*ECRISIS) under fixed effects method is insignificant across all models. This suggests that a decrease in U.S. stock

index returns during their financial crisis period could not adversely affect BRIC index returns during that time. In general, the above findings in table 4.5 are similar to the findings using BRICS as a group of emerging countries. Thus exclusion of South Africa from the sample does not change the BRIC-U.S. index returns relationship and the impact of the U.S. crisis on the BRIC markets' performance. This evidence also supports my previous findings using BRICS.

The last table of the regression outputs in this thesis is presented in table 4.6 where fixed effects method is applied on model specifications that include both global financial crisis and BRICS-specific financial crises simultaneously.

Table 4.6: Panel Regression (BRICS): Global Financial Crisis and BRICS-specific Financial Crises Using Fixed Effects Method

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
USINDEX	1.321*** (22.854)	1.315*** (22.732)	1.270*** (21.298)	1.264*** (21.182)	1.238*** (17.724)	1.226*** (17.516)
ECRISIS	-	-	-	-	0.023** (2.402)	0.024** (2.456)
BRICS-CRISES	-0.015 (-1.281)	-0.019* (-1.601)	-0.025** (-2.068)	-0.028** (-2.376)	-0.024** (-1.977)	-0.027** (-2.287)
USINDEX* ECRISIS	-	-	-	-	0.284* (1.900)	0.311** (2.090)
USINDEX* BRICS-CRISES	-	-	0.757*** (3.311)	0.750*** (3.285)	0.787*** (3.407)	0.788*** (3.415)
GDPGR	0.014 (1.120)	-	0.015 (1.217)	-	0.012 (1.018)	-
EXP_GR	-	-0.323* (-1.643)	-	-0.325* (-1.659)	-	-0.342* (-1.747)
INT	0.000 (0.180)	0.000 (-0.227)	0 000 (0.182)	0.000 (-0.248)	0.000 (0.200)	0.000 (-0.195)
EXCH	0.000* (1.927)	0.000* (1.639)	0.000** (2.008)	0.000* (1.706)	0.000** (2.050)	0.000* (1.770)
INDEX(-1)	0.025 (1.031)	0.023 (0.967)	0.026 (1.079)	0.024 (1.015)	0.027 (1.094)	0.024 (1.006)
CONSTANT	-0.004 (-0.588)	0.007 (1.503)	-0.005 (-0.622)	0.008 (1.588)	-0.005 (-0.643)	0.006 (1.302)
Sample size	1174	1174	1174	1174	1174	1174
R-Square	0.32	0.32	0.32	0.32	0.32	0.33
F-Statistics	54.826***	55.039***	51.267***	51.439***	44.128***	44.360***
Hausman Test (p-value)	19.558*** (0.002)	22.830*** 0.000	21.68*** (0.001)	25.179*** 0.000	20.126*** (0.003)	23.608*** (0.001)
Country-specific Effects	B- 0.006 R- 0.009 I- (0.003) C- (0.012) S-0.001	B-0.004 R-0.008 I-(0.001) C-(0.005) S-(0.004)	B- 0.007 R- 0.009 I- (0.003) C- (0.012) S-0.001	B-0.005 R-0.007 I-(0.001) C-(0.006) S-(0.004)	B- 0.006 R- 0.009 I- (0.003) C- (0.011) S-0.001	B- 0.005 R- 0.007 I- (0.001) C- (0.005) S-(0.004)

***,**,* imply the significance of each coefficient at the 1%, 5% and 10% level, respectively. T-statistics corresponding to coefficients are in parenthesis.

Table 4.6 presents similar evidence as observed in previous tables using fixed effects method. Also I find a positive influence of U.S. stock index returns on BRICS stock index returns at the 1% level as observed in previous regression results. The coefficient of this relationship ranges from 1.226 in model 6 to as high as 1.321 in model 1 (under fixed effects estimation). This positive relationship is consistent with the findings of Kenourgios et al. (2011) suggesting that there are clear contagion effects between U.S. and BRICS stock markets. The significance of global financial crisis (ECRISIS) is also consistent across all models and positively significant. For example, model specification 6 exhibits that the returns of BRICS stock index increased by 0.024% during the global financial crisis compared to non-crisis period. On the other hand, BRICS-CRISES indicates that BRICS stock index returns are negatively influenced by BRICS-specific financial crises. The coefficient of BRICS-CRISES is significant and negative. As an example, model specification 6 indicates that BRICS stock index returns decreased by 0.027% during the period of financial crises in BRICS economics relative to non-crisis period in those countries. Though the coefficient of BRICS-CRISES is insignificant in model 1, the coefficient is still negative. In addition, the effect is found highly significant (up to 5% level) in all other model specifications. This implies that when there are financial market crises in the BRICS countries, stock market performance significantly deteriorates in these economies.

Furthermore, the interaction terms for both U.S. global financial crisis (USINDEX*ECRISIS) and BRICS-specific crises (USINDEX*BRICS-CRISES) with the U.S. stock index returns are found significant. Models 5 and 6 include both (USINDEX*ECRISIS) and (USINDEX*BRICS-CRISES) indicating that BRICS stock index returns move in the same direction as U.S. index returns change during the periods of financial crisis regardless of the actual origin of the crisis. For example, model 6 exhibits that 1% increase (decrease) of U.S. index returns caused 0.311%

increase (decrease) in returns of BRICS stock index during the U.S. financial crisis whereas 1% increase (decrease) in U.S. index returns resulted in 0.788% increase (decrease) in BRICS index returns during the periods of BRICS financial crises. This implies that when BRICS countries experience their own financial crises, returns in BRICS stock market tends to fluctuate more with respect to U.S. stock returns than it does during the period of U.S. financial crisis. As argued by Dimitriou et al. (2013), BRICSs' economies have built up strong consumer demand after a decade of growth, accumulated high levels of foreign exchange reserves and significant budget surpluses and thus the impact of U.S. financial crisis is minimal. Evidence obtained on both financial crises (global and BRICS-specific) is found consistent. For instance, model 5 includes both variables and exhibits the same relationship as found in model 6. The above finding also suggests that if the U.S. stock market performs well during any BRICS-specific financial crises, BRICS stock market performance can be less affected by local crisis. As an example, the coefficients of (USINDEX*ECRISIS) and (USINDEX*BRICS-CRISES) are 0.311 and 0.788, respectively in model 6. This implies that the positive impact of increase in U.S. index returns on BRICS index returns is significantly higher in the case of BRICS-specific financial crises compared to U.S. crisis (0.788 versus 0.311). Hence, investing in the U.S. market during the period of domestic financial crises can be beneficial if the U.S. stock market performs well during this time. Given the fact that the U.S. index usually underperforms when the U.S. economy experience own financial crisis, the downfall of BRICS index returns during this time is more likely (i.e., the coefficient is positive). Therefore, when comparing the consequences of U.S. versus BRICS-specific financial crises on index returns, the results suggest that investment in U.S. stock portfolio by BRICS investors is relatively beneficial when BRICS countries experience their own financial crises but the U.S. stock market performs well.

Examining the effect of macroeconomic variables reveals that both export growth rate (EXP_GR) and exchange rate (EXCH) have significant effects on BRICS stock index returns across all models. The coefficient for EXP_GR is, however, negative and significant at 10% level. As total export of a country grows, corporate investment increases in export-oriented sectors, and thus less amount of money is usually diverted to portfolio investments by corporate entities since real fixed investment in export oriented industries provides them higher return on investment in this situation. As a result of low volume of stock portfolio investments and subsequent low demand for domestic stocks by corporate investors, both index prices and returns are expected to fall given that a major fraction of portfolio investment is indeed done by corporate bodies in emerging countries. Further, as indicated in all model specifications, the coefficient of EXCH is economically negligible but is highly significant at the 10% level. This suggests that depreciation of local currency has a positive impact on domestic index returns of BRICS countries. This is consistent with Hwang et al. (2013) where exchange rates have significant and positive effect on stock returns in emerging countries. As U.S. dollar appreciates (local currency depreciates), BRICS stocks become cheaper in the eyes of American investors because one dollar is worth one more local currency. In this case, if the overall demand for BRICS stocks increases, stock prices rises due to upward demand shift of BRICS stocks. This finally results in increase in BRICS index returns.

4.4 Summary of Findings

This chapter has presented various regression outputs on the relationship between BRICS stock index return and U.S. stock index return. A number of results have been presented and the results obtained from different model specifications are found consistent. Based on the findings above, the following conclusions can be drawn:

1. There is a significant positive correlation between U.S. and BRICS index returns. As such U.S. stock market performance matters a lot in determining BRICS market performance. This is true regardless of financial market conditions during both crisis and non-crisis periods.
2. Though country-specific financial shock has a significant negative impact on stock portfolio returns in BRICS, evidence shows that BRICS stock markets was not adversely affected during the period of the recent U.S. financial crisis compared to non-crisis period. Hence, U.S. stocks could be a good choice along with BRICS stocks in stock portfolio selection.
3. The effect of the U.S. index on BRICS index returns is significantly higher during the time of domestic financial crises in BRICS countries compared to U.S. financial crisis. However, higher index returns are likely if U.S. market performs well during the period of financial crises in BRICS.
4. Positive correlation between BRICS index returns and U.S. index returns even during the U.S. crisis period says that BRICS portfolio investors experience low return on investment during the U.S. financial crisis as the U.S. index usually underperforms during this time.

CHAPTER FIVE

CONCLUSION

5.1 Findings and policy recommendations

Past studies provide evidence of the relationship between BRICS stock returns and U.S. stock returns using time series data. This thesis has examined this intriguing relationship using panel data and as such has provided findings based on panel regression methods. Some studies have also examined the effect of the recent global financial crisis of 2007-2008 on BRICS stock markets while others have analyzed the effect of country-specific crises such as the Asian financial crisis of 1997 on respective stock markets. In this thesis, both global financial crisis and BRICS-specific crises have been considered simultaneously. In order to control for subsequent effects of changes in economic performance, money market, and foreign exchange market on BRICS stock market performance, three macroeconomic indicators including GDP growth rate, interest rate, and exchange rate are employed in empirical models. This empirical analysis is conducted using monthly data of a sample period from 1990 to 2013. For robustness checks, the thesis includes findings based on stock index returns of BRIC instead of BRICS countries, results using export growth instead of GDP growth as a proxy variable of economic performance of BRICS countries, and findings based on different model specifications. A specification test used to investigate the adequacy of the statistical models (Hausman test) shows that fixed effects regression method is an appropriate specification.

Several significant results are obtained from this thesis. First, index returns of BRICS stock markets are significantly dependent on U.S. index returns. Results repeatedly show a positive correlation between these two indices, suggesting that there is a strong relationship between NYSE and BRICS stock markets. Importantly, this finding suggests that returns on investment in

BRICS stock markets increase when the NYSE market performs satisfactorily. Due to their one-to-one positive relation between U.S. and BRICS stock markets, investors can select stocks from both emerging and developed markets as this arrangement of asset allocation should increase total return on portfolio investment. Second, BRICS stock index return was not adversely affected during the period of the recent U.S. financial crisis compared to non-crisis period in the U.S. economy. Estimated results show that a positive association exists between BRICS index returns and U.S. index returns even during the U.S. financial crisis period. This finding points to the fact that it is possible for BRICS investors to earn relatively less return on their investments in stocks when the U.S. stock market's performance declines which is most likely during the time of financial downfall. Hence, a close monitoring of U.S. financial market is critical for BRICS investors who prefer to invest in stocks. Finally, the results reveal that during the time of domestic financial crisis in BRICS countries, a positive return of U.S. stock index has a significant positive impact on BRICS index return. The higher return is, however, likely if the U.S. stock market performs well during the time when BRICS countries are going through their own financial problems. This insinuates that potential gain for portfolio investors who have invested in both American and BRICS stocks can be realized if and only if the U.S. stock market performs well during the period of domestic financial crisis in BRICS countries. Therefore, how the U.S. stock market is performing during a financial crisis that matters a lot for BRICS investors since BRICS index returns are positively and significantly correlated with the U.S. index returns. This finding repeatedly suggests that stock investors in BRICS should keep track of the U.S. stock market performance on regular basis to predict future returns on investment in BRICS stocks.

Another important finding in this thesis is on the influence of BRICS's macroeconomic variables on stock market indices. Generally, among the macroeconomic indicators, exchange rate and export growth are two significant variables across model specifications. This implies that foreign exchange market and commodity trades play important roles in determining stock market returns in BRICS countries. The empirical results show that there is a need for international fund managers who invest in newly emerging stock markets to evaluate the value and stability of domestic currencies as part of their stock market investment decisions. In order to ensure significant growth in emerging stock markets, the regulatory bodies (for instance, policy makers in government agencies) should also endeavor to put in place necessary measures in favor of local currency value and growth in export sectors.

5.2 Limitations of this thesis

The thesis faces some limitations. One of which is the unavailability of data. Although data are available for most of the economic indicators, there was lack of stock index prices in the early nineties for some countries. For instance, monthly data was unavailable for Russia's stock index until 1994 since there was no electronic trading system till that time. As a result, there are no electronic data records maintained up to that year. Another limitation is about extreme observations in the data set, resulting in the problem of outliers. This is commonly found in cases of export growth data. However, such outliers have been removed from the sample by applying the extreme studentized deviate test. Due to the above limitations, sample size is limited in this thesis. Finally, most of data series except index returns are available on a yearly basis, which have been converted to monthly data. However, availability of actual monthly data could be more informative.

5.3 Recommendations for future research

This thesis highlights and offers avenues for future research using panel data. The inclusion of additional variables measuring the level of financial market development, commodity prices, country-specific governance, quality of government and political institutions is a possibility for increasing our understanding about the importance of such factors in the performance of emerging stock markets. A wide range of sample period should be considered for future study. Considering other emerging markets and developed countries might be beneficial to understand the dynamics of stock market relationship between these markets. This will also give an opportunity to consider the diversified nature of crises (such as, political crisis, real estate market crash) in an economy while estimating empirical models. This will strengthen our understanding about stock markets' responses to individual types of crises in emerging countries.

Another important future research could be the inclusion of financial crisis variables that will capture individual time-specific effects of financial crises of each BRICS economy. The interaction terms between U.S. index returns and time-specific variables will also allow us understanding the importance of the U.S. stock market performance during the financial crisis of individual BRICS economy. Furthermore, I suggest that panel methods can be applied on other geographically centered emerging market blocs such as ASEAN and Central and Eastern Europe (CEE). Further research may also apply panel methods on stock markets in Latin America and emerging G-9 countries in order to provide wider investigation into the interdependence with the developed markets. Finally, empirical models should consider the possibility of causality between BRICS and U.S. index returns for future research and estimation techniques can further be improved by using the Generalized Method of Moments (GMM).

REFERENCES

Alagidedea, P. and Panagiotidisb, T. (2010). Can Common Stocks Provide a Hedge against Inflation? Evidence from African Countries. *Review of Financial Economics, 19, 91-1000.*

Alam, M. M. and Uddin, M. G. S. (2009). Relationship between interest rate and stock price: empirical evidence from developed and developing countries. *International Journal of Business and Management, 43-51.*

Aloui, R., Aïssa, M., and Nguyen, D. (2011). Global financial crisis, extreme interdependences, and contagion effects: The role of economic structure? *Journal of Banking and Finance, 35, 130–141.*

Aron, J. and Muellbauer, J. (2005). Review of Monetary Policy in South Africa during 1994-2004. *Conference Paper at :http://akadweb.sun.ac.za/economics/econconf/programme.htm*

Bank for International Settlements (2009). The international financial crisis: Timeline, impact and policy responses in Asia and the Pacific, *1-62. Hong Kong: BIS Representative Office for Asia and the Pacific (Andrew Filardo, Jason George, MicoLoretan, Guonan Ma, Anella Munro, Ilhyock Shim, Philip Wooldridge, James Yetman and Haibin Zhu).*

Basher, S. A., Haug, A. A., and Sadorsky, P. (2012). Oil prices, exchange rates and emerging stock markets. *Energy Economics, 31, 227–240.*

Beck, T. and Levine, R. (2004). Stock markets, banks, and growth: Panel evidence. *Journal of Banking and Finance 28, 423–442.*

Bekiros, S. (2014). Contagion, decoupling and the spillover effects of the US financial crisis: Evidence from the BRIC markets. *International Review of Financial Analysis, 33, 58-69.*

Binti, H., Kadir, A., Selamat, Z., Masuga T, and Taudi, R. (2011). Predictability power of interest rate and exchange rate volatility on stock market return and volatility: Evidence from Bursa Malaysia. *International Conference on Economics and Finance Research (IPEDR), 4, IACSIT press, Singapore.*

Bloomberg Business (2015). Database available online as at March 2015.

Bulmash, S. B., and Trivoli, G. W. (1991). Time-lagged interactions between stock prices and selected economic variables. *Journal of Portfolio Management, 17, 61 – 67.*

Buyukşalvarcı, A. (2010). The Effects of Macroeconomics Variables on Stock Returns: Evidence from Turkey. *European Journal on Social Science, 14, 404–416.*

Chaudhuri, K. and Smiles, S. (2004). Stock Market and Aggregate Economic Activity: Evidence from Australia. *Applied Financial Economics, 14, 121-129.*

Chiang, T. C. and Yang, S. Y. (2003). Foreign exchange risk premiums and time-varying equity market risks. *International Journal of Risk Assessment and Management, 4, 310–331.*

Chinzara, Z. (2011). Macroeconomic Uncertainty and Conditional Stock Market Volatility in South Africa. *South African Journal of Economics, 79, 27-49.*

Chkili, W. and Nguyen, D. K. (2014). Exchange rate movements and stock market returns in a regime-switching environment: Evidence for BRICS countries. *Research in International Business and Finance 31, 46–56.*

Chkili, W., Aloui, C., Masood, O. and Fry, J. (2011). Stock market volatility and exchange rates in emerging countries: a Markov-state switching approach. *Emerging Markets Review 12, 272–292.*

Creti, A., Joets, M. and Mignon, V. (2013). On the link between stock and commodity markets' volatility. *Energy Economics 37, 16–28.*

Dimitriou, D., Kenourgios, D., and Simos, T. (2013). Global financial crisis and emerging stock market contagion: a multivariate FIAPARCH– DCC approach. *International Review Financial Analysis 30, 46–56.*

Dooley, M. and Hutchison, M. (2009). Transmission of the U.S. Subprime Crisis to Emerging Markets: Evidence on the Decoupling-Recoupling Hypothesis. *JIMF/Warwick Conference.*

Eita, J. H. (2012). Explaining Interest Rate Spread in Namibia. *International Business and Economics Research Journal, 11, 1123 - 1132.*

Evangelist, M. and Sathe, V. (2006). Brazil's 1998-1999 currency crisis, Working Paper, University of Michigan.

Fama, E. F. (1981). Stock returns, real activity, inflation, and money. *American Economic Review, 71, 545 – 565.*

Federal Reserve Board of St. Louis (2009). The financial crisis: A timeline of events and policy actions.

Fifield, S. G. M., Power, D. M. and Sinclair, C. D. (2002). Macroeconomic Factors and Share Returns: An Analysis using Emerging Market Data. *International Journal of Finance and Economics, 33, 51-62.*

Filis, G., Degiannakis, S., and Floros, C. (2011). Dynamic correlation between stock market and oil prices: the case of oil-importing and oil-exporting countries. *International Review Financial Analysis 20, 152–164.*

Frank, W. P., and Frank, E. C. (2010). International business challenge: Can the BRIC countries take world economic leadership away for the traditional leadership in the near future? *International Journal of Arts and Sciences, 3, 46–54.*

Gay, R. D. (2008). Effect of Macroeconomic Variables On Stock Market Returns For Four Emerging Economies: Brazil, Russia, India and China. *International Business and Economics Research Journal, 7, 1-7.*

Gebka, B. (2008).Volume and size-related lead-lag effects in stock returns and volatility: An empirical investigation of the Warsaw Stock Exchange. *International Review of Financial Analysis, 17, 134-155.*

Gilenko, E., and Fedorova, E. (2014) Internal and external spillover effects for the BRIC countries: multivariate GARCH-in-mean approach. *Research International Business and Finance 31, 32–45.*

Goswami, G. and Jung, S.C. (1997). Stock Market and Economic Forces: Evidence from Korea. *IMF Working Paper.*

Griffin, J. M. and Stulz, R. M. (2001). International competition and exchange rate shocks: A cross-country industry analysis of stock returns. *Review of Financial Studies, 14, 215 – 241.*

Guesmi, K., and Fattoum, S. (2014). Return and volatility transmission between oil prices and oil-exporting and oil-importing countries. *Economic Modelling, 38, 305–310.*

Harasty, H., and Roulet, J. (2000). Modeling stock market returns, *Journal of Portfolio Management, 33–46.*

Harrison, B., and Moore, W. (2009). Spillover effects from London and Frankfurt to Central and Eastern European stock markets. *Applied Financial Economics 19, 1509–1521.*

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46, 1251–1272.*

Hou, K. (2007). Industry Information Diffusion and the Lead-lag Effect in Stock Returns. *Review of Financial Studies, 20, 1113-1138.*

Hsing, Y. (2011). The Stock Market and Macroeconomic Variables in a BRICS Country and Policy Implications. *International Journal of Economics and Financial Issues, 1, 12-18*

Humpe, A. and Macmillan, P. (2009).Can Macroeconomic Variables Explain Long-Term Stock Market Movements? A Comparison of the US and Japan. *Applied Financial Economics, 19, 111-119.*

Hwang, E., Min, H. G., Kim, B. H., and Kim, H. (2013). Determinants of stock market comovements among US and emerging economies during the US financial crisis. *Economic Modelling, 35, 338–348.*

Ibrahim, M. H. and Aziz, H. (2003). Macroeconomic variable and the Malaysian equity market: A view through rolling subsamples. *Journal of Economic Studies, 30, 6-27.*

Im, K. S., Pesaran, M. H. and Shin, Y. (2003). Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics, 115, 53-74.*

International Monetary Fund (IMF) World Economic Outlook April 2015 report.

Jefferis, K. R. and Okeahalam, C. C. (2000). The Impact of Economic Fundamentals on Stock Markets in Southern Africa. *Development Southern Africa, 17, 23-51.*

Kenourgios, D., Samitas, A., and Paltalidis, N. (2011). Financial crises and stock market contagion in a multivariate time-varying asymmetric framework. *International Financial Markets, Institutions and Money, 21, 92–106.*

Kiersz, A. (2014). "The NYSE Makes Stock Exchanges Around The World Look Tiny." *Business Insider Australia. Available online as at January 7, 2015.* http://www.businessinsider.com.au/global-stock-market-capitalization-chart-2014-11/

Kim, K. (2003). Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. *Review of Financial Economics 12, 301 – 313.*

Kupchan, C. A. (2012). "The World in 2050: When the 5 Largest Economies Are the BRICs and U.S." Excerpted from "No One's World" by Author. *Oxford University Press.*

Levine, R. (1997). Financial Development and Economic Growth: Views and Agenda", *Journal of Economic Literature, 35, 688-726.*

Levine, R. (2005). Finance and growth: Theory and evidence. *National Bureau of Economic Research (NBER) Working Paper 10766.*

Madsen, J. B., Dzhumashev, R. and Yao, H. (2013). Stock returns and economic growth. *Applied Economics, 45.*

Maku, O. E. and Atanda, A. (2009). Does Macroeconomic Indicators exert shock on the Nigerian Capital Market? Online at http://mpra.ub.uni-muenchen.de/17917/ MPRA (Munich Personal RePEc Archive) Paper No. 17917.

Mighri, Z. and Mansouri, F. (2014). Modeling international stock market contagion using multivariate fractionally integrated APARCH approach. *Cogent Economics and Finance.* http://dx.doi.org/10.1080/23322039.2014.963632.

Mollick, A. V. and Assefa, T. A. (2013). U.S. stock returns and oil prices: the tale from daily data and the 2008–2009 financial crisis. *Energy Economics 36, 1–18.*

Morgan Stanley Corporation Indices (MSCI) database. Last available online December 2, 2014.

Narayan, P.K., and Narayan, S. (2010). Modeling the Impact of Oil Prices on Vietnam's Stock Prices. *Applied Energy Journal*, 87, *356 - 361.*

National Bureau of Statistics (NBS), (2014). *Consumer price index and inflation report of April 7, 2014 from www.nigerianstat.gov.ng/dataRelease*

OANDA (2015) www.oanda.com. *Available online as at January 10, 2015.*

Osamwonyi, I.O. and Evbayiro-Osagie, E. I. (2012). The Relationship between Macroeconomic Variables and Stock Market Index in Nigeria. *Journal of Economics, 3, 55-63.*

Pesaran, M. H., Shin, Y., and Smith, R.J. (2001).Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics, 16, 289-326.*

Phylaktis, K. and Ravazzolo, F., (2005). Stock prices and exchange rate dynamics. *Journal of International Money and Finance 24, 1031–1053.*

Pilinkus D. (2010). Macroeconomic indicators and their impact on stock market performance in the short and long run: the case of the Baltic States. *Technological and Economic Development of Economy, 16, 291-304.*

Pilinkus, D. and Boguslauskas, V. (2009). The Short-run relationship between stock market prices and macroeconomic variables in Lithuania: an application of the impulse response function. *Economics of Engineering Decisions, 5, 1-9.*

Pimentel, R. C. and Choudhry, T. (2014). Stock Returns under High Inflation and Interest Rates: Evidence from the Brazilian Market. *Emerging Markets Finance and Trade. 50, 71 – 92.*

Pinheiro, A. C., Giambiagi, F. and Moreira, M. M. (2001). Brazil in the 1990s: A successful transition. *Discussion paper 91, Rio de Janeiro.*

Pradhan, R. P., Dasgupta, P. and Bele, S. (2013). Finance, development and economic growth in BRICS: A panel data analysis. *Journal of Quantitative Economics, 11, 308-322.*

Ratanapakorn, O. and Sharma, C. (2007). Dynamic Analysis between the US Stock Returns and the Macroeconomic Variables. *Applied Financial Economics, 17, 369-337.*

Remonola E. M. (1990). Understanding international differences in leverage trends. *Federal Reserve Bank of New York.*

Report on U.S. Portfolio Holdings of Foreign Securities as of December 31, 2007. *Department of the Treasury, Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System. Published October 2008.* http://www.treasury.gov/resource-center/data-chart-center/tic/Pages/fpis.aspx

Saleem, K. and Vaihekoski, M. (2008).Pricing of global and local sources of risking Russian stock market. *Emerging Markets Review, 9, 40 – 56.*

Schwert, W. (1990). Stock returns and real activity: a century of evidence. *Journal of Finance. 45, 1237–1257.*

Serikova, E. (2012). Is Moscow Stock Exchange sufficiently liquid? The evidence from cross-listing. *Department of Economics, Central European University (CEU eTD Collection), Budapest, Hungary.*

Stern, N. (1989). The economics of development: A survey. *The Economics Journal, 99, 597 – 685.*

Syllignakis, M. N., and Kouretas, G. P. (2011). Dynamic correlation analysis of financial contagion: Evidence from the Central and Eastern European markets. *International Review of Economics and Finance, 20*, 717-732. http://dx.doi.org/10.1016/j.iref.2011.01.006.

Syriopoulos, T., Makram, B. and Boubaker, A. (2015). Stock market volatility spillovers and portfolio hedging: BRICS and the financial crisis. *International Review of Financial Analysis 39, 7 – 18.*

Usman, M. L. (2015). Globalization of China and Nigeria's Language Educational Policy. A case study. *U.S.-China Education Review, 5, 411-434.*

Verbeek, M. (2000). A guide to modern econometrics. *John Wiley and Sons Limited, Chichester, U.K.*

Wiel, I. V.D (2013) "The Russian Crisis 1998" *Rabobank Economic Report. Available online as at March 1, 2015* *https://economics.rabobank.com/publications/2013/september/the-russian-crisis-1998/*

Wilson, D. and Purushothaman, R. (2003). Dreaming with BRICs: The path to 2050. *Goldmans Sachs Global Economics paper, 99, 1 -22.*

Wongbangpo, P. and Sharma, S. C. (2002). Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries. *Journal of Asian Economics 13, 27 – 51.*

World Bank World Economic Indicators, Washington, (DC): World Bank; 2015

World Federation of Exchanges. *January 2015 Report and Statistics.* www.world-exchanges.org

Worstall, T. (2014). "Fun Number: Apple Is Now Worth More than the Entire Russian Stock Market" *Forbes Report, November 2014.*

Xu, H. and Hamori, S., (2012). Dynamic linkages of stock prices between the BRICs and the United States: effects of the 2008–2009 financial crisis. *Journal of Asian Economics. 23, 344–352.*

Zhang, B., Li, X., and Yu, H. (2013). Has recent financial crisis change permanently the correlation between BRICS and developed stock markets? *North American Journal of Economics and Finance, 26, 725-738.*

Zhao, H., (2010). Dynamic relationship between exchange rate and stock price: evidence from China. *Research in International Business and Finance, 24, 103–112.*